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## 2010 Crown Victoria, Grand Marquis Workshop Manual

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### Quick Links

[Introduction](#)

[Master DTC Chart](#)

[Specifications](#)

[Metrics](#)

[Torque Wrench Adapter Formulas](#)

[Acronyms](#)

[Alphabetical Index](#)

### Table of Contents

1: General Information

[00: Service Information](#)

2: Chassis

[04: Suspension](#)

[05: Driveline](#)

[06: Brake System](#)

[11: Steering System](#)

3: Powertrain

[03: Engine](#)

[07: Automatic Transmission](#)

[09: Exhaust System](#)

[10: Fuel System](#)

4: Electrical

[12: Climate Control System](#)

[13: Instrumentation and Warning Systems](#)

14: Battery and Charging System

15: Audio Systems

17: Lighting

18: Electrical Distribution

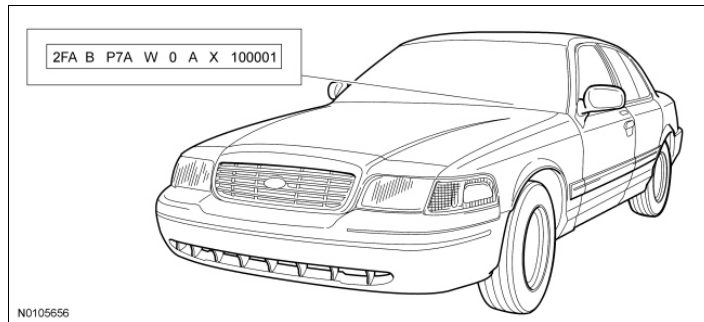
19: Electronic Feature Group

5: Body and Paint

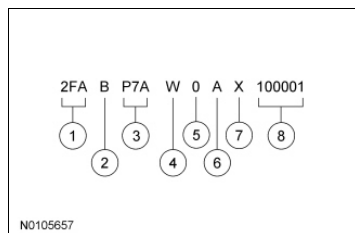
01: Body

02: Frame and Mounting



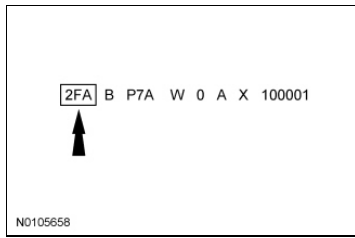
**Identification Codes****Vehicle Identification Number (VIN)****Vehicle Identification Number (VIN) Location**

The Vehicle Identification Number (VIN) is a 17-digit combination of letters and numbers. The VIN is stamped on a metal tab riveted to the instrument panel, top upper left of the instrument panel. The VIN is also found on the Vehicle Certification (VC) label. If the VIN plate requires replacement, authorized dealers must contact their respective regional office.



Item	Description
1	World Manufacturer Identifier (WMI)
2	Restraint type code
3	Vehicle line and series code
4	Engine code
5	Vehicle Identification Number (VIN) check digit
6	Model year code
7	Assembly plant code
8	Production sequence number

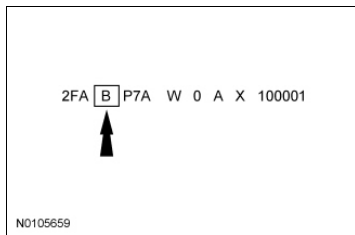
**World Manufacturer Identifier (WMI)**



The first 3 VIN positions are the World Manufacturer Identifier (WMI) code.

- 2FA - Ford Motor Company of Canada Ltd., passenger car
- 2ME - Ford Motor Company of Canada Ltd., Mercury, passenger car

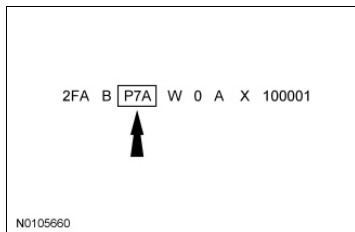
#### Restraint Type Code



The fourth VIN position is the vehicle restraint system type code.

- B - Active safety belts - all positions, driver and front passenger air bags and driver and front passenger side impact air bags

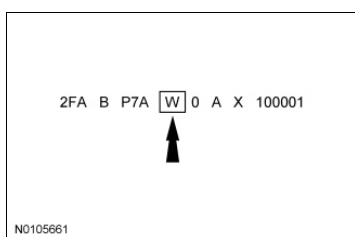
#### Vehicle Line and Series Code



Positions 5 through 7 indicate vehicle line, series and body type.

- P7A - Crown Victoria (Long wheelbase)
- P7B - Crown Victoria (Police Interceptor)
- P7C - Crown Victoria (Base fleet vehicle)
- P7E - Crown Victoria (LX 4-door)
- M7A - Grand Marquis (Long wheelbase)
- M7E - Grand Marquis (GS 4-door)
- M7F - Grand Marquis (LS 4-door)

#### Engine Code

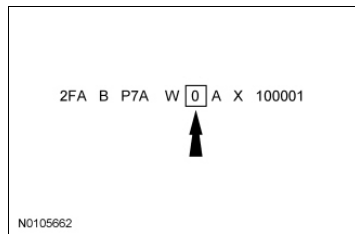


The eighth VIN position is the engine displacement and number of cylinders code.

- W - 4.6L electronic fuel injection, SOHC, 8-cylinder, gasoline
- V - 4.6L electronic fuel injection, SOHC, 8-cylinder, flex fuel

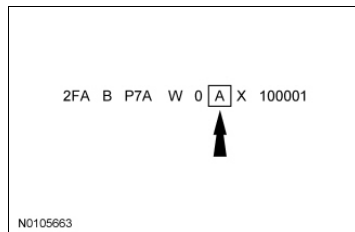
Additional engine information can be obtained from the engine tag. Refer to [Section 303-01](#).

#### Check Digit Code



The ninth VIN position is the check digit code (0-9).

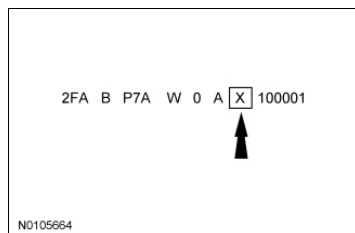
#### Model Year Code



The tenth VIN position is the model year code.

- A- 2010

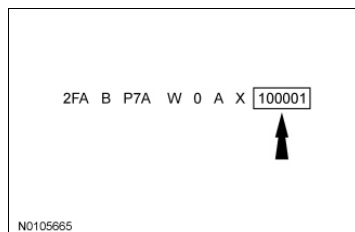
#### Assembly Plant Code



The eleventh VIN position is the assembly plant code.

- X - St. Thomas, Talbotville, Ontario (Canada)

#### Production Sequence Code



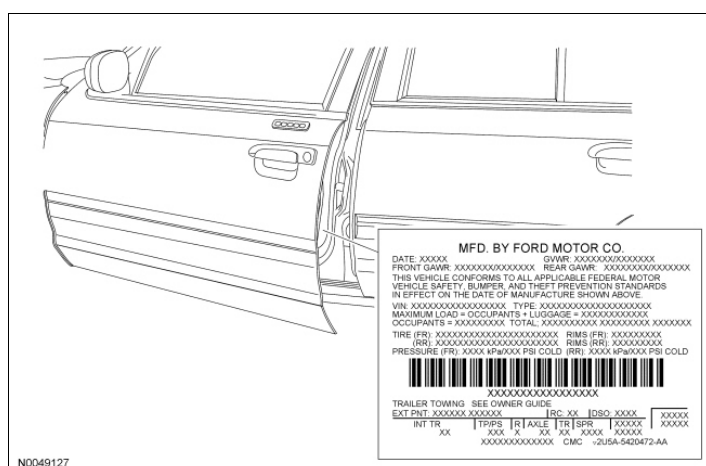
## 2010 Crown Victoria, Grand Marquis Workshop Manual

The last 6 VIN positions are the production sequence number. These 6 digits also are used as the vehicle serial and warranty number. The serial number can also be found on the engine block, transmission and frame.

- Ford - 100001-599999
- Mercury - 600001-999999

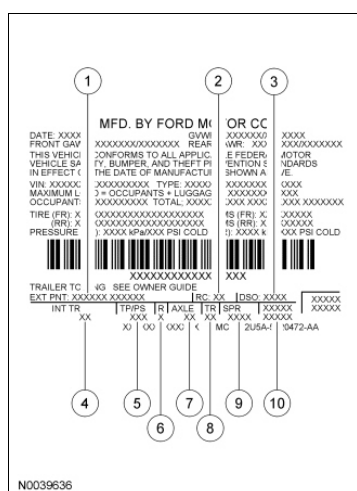
### Vehicle Certification (VC) Label

#### Vehicle Certification (VC) Label Location



The upper portion of the Vehicle Certification (VC) label contains the manufacturer name, the month and year of manufacture, the certification statement and the Vehicle Identification Number (VIN). It also includes Gross Vehicle Weight Rating (GVWR) as well as tire size and pressure ratings. The VC label is located on the LH front door edge.

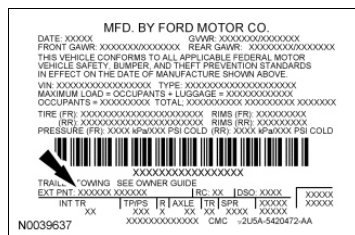
If a vehicle requires replacement of the VC label and is 4 years old or less, an authorized dealer must submit the VIN to their respective regional office. The regional office will submit a web form to the assembly plant for the replacement label. Once the label has been printed, a representative from the regional office will deliver the label to the dealer and witness installation on the vehicle. If a vehicle is more than 4 years old and requires a replacement label, the dealer must submit a request to the Department of Motor Vehicles.



Item	Description
1	Exterior paint color code

2	Region code
3	Domestic special order
4	Interior trim code
5	Tape/paint stripe code
6	Radio code
7	Axle code
8	Transmission code
9	Spring code
10	Powertrain calibration information

### Paint Code



The first set of numbers/letters listed indicate the vehicle primary body color code. The second set of letters/numbers listed (if applicable), indicate a 2-tone or accent body color code. All colors are base coat/clear coat.

#### Primary Body Color

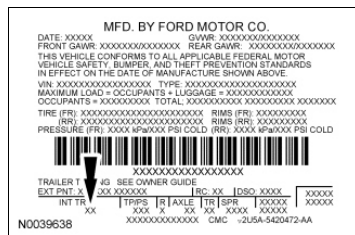
- AQ - Arizona Beige
- BU - Medium Brown Metallic
- BY - School Bus Yellow
- HG - Smokestone
- JL - Dark Toreador Red
- JP - Silver Birch Metallic
- KR - Norcea Blue Pearl
- LK - Dark Blue
- LM - Royal Blue
- LN - Light Blue Metallic
- LS - Light Ice Blue Metallic
- MM - Ultra Blue
- TM - Light Gray
- TN - Silver Gray Metallic
- UA - Ebony
- WT - Performance White
- YG - Medium Titanium

#### Accent Body Color

- AQ - Arizona Beige
- BU - Medium Brown Metallic
- BY - School Bus Yellow
- HG - Smokestone
- JL - Dark Toreador Red
- JP - Silver Birch Metallic

- KR - Norcea Blue
- LK - Dark Blue
- LM - Royal Blue
- LN - Light Blue Metallic
- LS - Light Ice Blue Metallic
- MM - Ultra Blue
- TM - Light Gray
- TN - Silver Gray Metallic
- UA - Ebony
- WT - Performance White
- YG - Medium Titanium

## Interior Trim Code



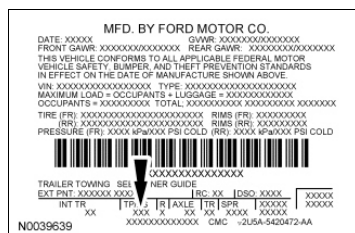
The interior trim codes are listed below. The first letter/number is for the interior fabric. The second letter is for the interior color.

- B - Atmore cloth 50/50 bench, Ford
- C - G-Grain vinyl 40/20/40 bench, Ford
- D - Atmore cloth 40/20/40 bench, Mercury
- F - Luxury Atmore cloth 40/20/40 split bench, Ford
- H - Stockton cloth (front bucket with cloth rear seats), Ford
- I - Stockton cloth (front bucket seats with vinyl rear seat), Ford
- L - Milled Pebble leather 50/50 bench, Mercury
- N - Milled Pebble leather 40/20/40 bench, Mercury
- P - Laura cloth (split bench), Ford
- R - G-Grain vinyl seats, Ford
- Z - G-Grain Super Soft Milled Pebble leather 40/20/40 split bench, Ford

The interior trim colors are:

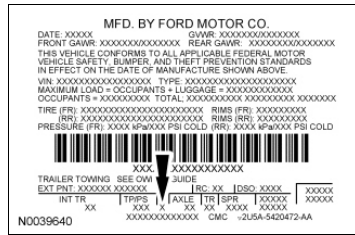
- J - Light Camel, Mercury/Ford
- L - Medium Light Stone, Mercury/Ford
- N - Charcoal Black, Ford

## Tape and Paint Stripe Code



Tape and paint stripe codes do not apply.

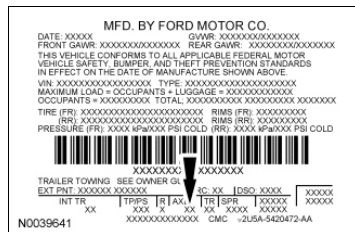
## Radio Code



The radio type codes are:

- B - Pre-equipment package 1
- F - Electronic AM/FM stereo
- K - Premium electronic AM/FM stereo with cassette, CD and clock
- X - Electronic AM/FM stereo with 6-disc CD changer
- Y - Radio delete
- Z - Electronic AM/FM stereo with CD player and clock

## Axle Ratio Code

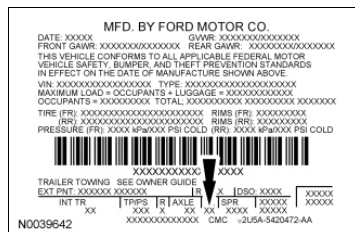


The axle ratios are:

- 58 - 2.73 conventional (non-limited slip) - without traction control
- C6 - 3.55 limited slip
- C8 - 2.73 conventional (non-limited slip) - with traction control
- X5 - 3.27 limited slip
- Z5 - 3.27 conventional (non-limited slip)

Additional axle information can be obtained from the axle tag. Refer to [Section 205-00](#).

## Transmission Code

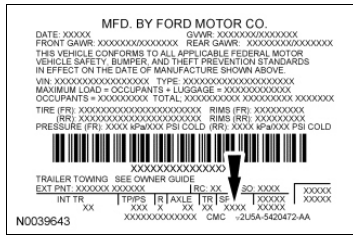


The transmission codes are:

- Q - 4-speed automatic overdrive (4R75E)

Additional transmission information can be obtained from the transmission tag. Refer to [Section 307-01](#).

## Spring Code



The first 2 characters listed identifies the front spring codes. The second 2 characters listed identifies the rear spring codes.

### Front Springs

- BB - 9W73-18B036-D
- CC - 9W73-18B036-A
- EE - 9W73-18B036-B
- GG - 9W73-18B036-C

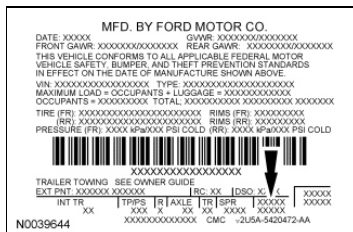
### Rear Springs

- 22 - 8W73-5560-D
- 44 - 8W73-5560-A
- 55 - 8W73-5560-B
- 66 - 8W73-5560-C

Rear air suspension codes are:

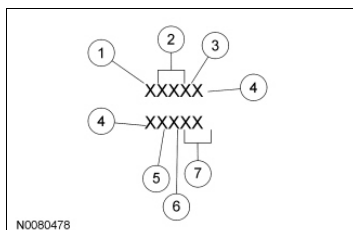
- 77 - 6W13-5A891-A

## Powertrain Calibration Information



**NOTE:** Powertrain calibration information is limited to a maximum of 5 characters per line on the Vehicle Certification (VC) label. Calibration identification consisting of more than 5 characters will wrap to the second line on the VC label.

Powertrain calibration information is printed in the lower right corner of the VC label. Only the base calibration information is printed. Revision levels will not appear, however, they can be found obtained through a scan tool using the most current software revision.





Item	Description
1	Model year (model year in which calibration strategy was first introduced)
2	Vehicle code
3	Transmission code
4	Unique calibration (designates different hardware for similar vehicles), example: tires and drive ratios
5	Fleet code (describes fleet to which the vehicle belongs), example: 6 - Evaporative Emission (EVAP)
6	Certification region (lead region where multiple regions are included in one calibration), example: A - US federal
7	Revision level (will advance as revisions occur), obtained through scan tool

Powertrain calibration Protocol 3 strategy is explained in more detail in the following:

#### Model Year

Position 1 indicates the model year in which the calibration was first introduced.

- 1 - 2001
- 2 - 2002
- 3 - 2003
- 4 - 2004
- 5 - 2005
- 6 - 2006
- 7 - 2007
- 8 - 2008
- 9 - 2009
- A - 2010

#### Vehicle Code

Position 2 identifies the vehicle line in code.

- FB - Crown Victoria/Grand Marquis

#### Transmission Code

Position 3 identifies the transmission type in code.

- 1 - Automatic transmission

#### Unique Calibration

Position 4 is explained in the following:

The Emissions/Corporate Average Fuel Economy/CO2 Compliance Department is responsible for assigning these calibration codes. Unique calibration identifications are assigned to cover similar vehicles to differentiate between tires, drive configurations, final drive ratios and other calibration-significant factors.

These 2 characters are selected by the analyst to provide identifiable information unique to each calibration. For example, using the number 2 to denote a 2-valve engine versus using the number 4 to denote a 4-valve engine, provides an easily identifiable difference.

### **Fleet Code**

Position 5 - Fleet calibration coding is as follows:

- 0 - Certification (US 4K, final sale in export markets)
- 1 - Heavy duty gas engine/Dyno
- 2 - Fast Automotive Manufacturers' Association, US
- 3 - Alternative durability protocol, US
- 4 - Not assigned
- 5 - Not assigned
- 6 - EVAP
- 7 - Mileage accumulation aging endurance durability
- 8 - On-Board Diagnostic (OBD)
- 9 - Not assigned

### **Certification Regions**

Position 6 - Certification region. Lists the lead region where multiple regions are included in one calibration.

- 5 - US 50 states
- A - US Federal (including altitude, may include Canada or Mexico)
- B - US California standard (includes US green states)
- C - Canada
- D - China
- E - European Community (Austria, Belgium, Denmark, Finland, Germany, Greece, Ireland, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)
- F - Extended European Community (Croatia, Czech Republic, Estonia, Hungary, Norway, Poland, Romania, Russian Federation, Slovakia, Slovenia, Switzerland, Yugoslavia)
- G - Gulf Cooperative Council
- H - Hong Kong
- J - Japan
- K - Korea
- L - Malaysia
- M - Mexico
- N - New Zealand
- P - Australia
- Q - South America (Brazil)
- S - Singapore
- T - Taiwan
- U - South America (unleaded fuel)
- V - Vietnam
- X - Rest Of World (ROW)
- Y - Military
- Z - Israel

### **Revision Level**

The revision level will advance as revisions occur. Not printed on label.

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## Jacking and Lifting

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Never get underneath a vehicle that is supported only by a jack. The jack could unintentionally lower. Always support vehicle with floor stands. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Only raise the vehicle when positioned on a hard, level surface. Attempting to raise the vehicle on an uneven or soft surface may result in vehicle slipping or falling from the jack or jackstand. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When jacking or lifting the vehicle, block all wheels remaining on the ground. Set the parking brake if the rear wheels will remain on the ground. These actions help prevent unintended vehicle movement. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** The jack provided with the vehicle is intended to be used in an emergency for changing a deflated tire. To avoid damage to the vehicle, never use the jack to hoist the vehicle for any other purpose.

**NOTICE:** Do not attempt to use jack pressure on either the front bumper or the rear bumper of any vehicle. Damage to bumper covers will occur.

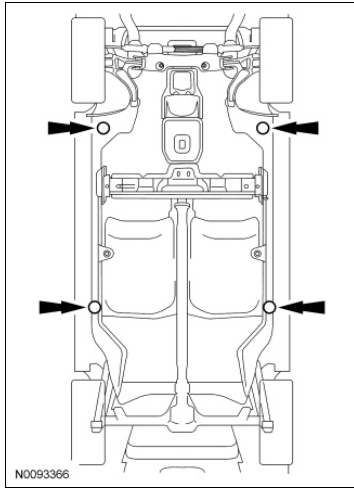
**NOTICE:** To prevent possible damage to the underbody, do not drive the vehicle onto the drive-on lift without first checking for possible interference.

**NOTICE:** Make sure the jack has an adequate lifting capacity for the vehicle being lifted.

**NOTICE:** When raising a vehicle on a twin-post hoist, use care when positioning the vehicle so that the hoisting forks do not interfere with the suspension components, mounting brackets or stabilizer mounting brackets, if so equipped. In addition, use care in hoist positioning to avoid possible damage to the axle carrier or rear cover.

**NOTICE:** Damage to the suspension, exhaust or steering linkage components may occur if care is not exercised when positioning the hoist adapters prior to lifting the vehicle.

### Jacking and Lifting Points - Front and Rear



**Torque Specifications**

Description	Nm	lb-ft	lb-in
Catalytic converter-to-muffler clamp nuts	45	33	-
Fire suppression manifold bolts	3	-	27
Fire Suppression System Module (FSSM) bolts	12	-	106
Fire suppressor bolts	30	22	-
Fire suppressor retainer nuts	30	22	-

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## Fire Suppression System

**⚠ WARNING:** The fire suppression system backup power supply must be depleted before lifting the vehicle or when repairing or replacing any of the following:

- Fire suppression system components
- Components located near the fire suppression manual switch
- Fuel tank and components located near the fuel tank
- Rear axle and components located near the rear axle

To deplete the backup power supply, disconnect the battery and wait at least 1 minute. Be sure to disconnect all auxiliary batteries and power supplies (if equipped). Failure to follow these instructions may result in serious personal injury.

The fire suppression system is designed to help reduce the risk of fire in high speed rear impacts. The fire suppression system deploys chemicals designed to suppress the spread of fire or potentially extinguish a fire, thereby providing more time for occupants to escape from a crashed vehicle.

The fire suppression system can be activated:

- automatically when a high speed, high energy rear impact has occurred.
- manually when other situations require fire suppression.

In the event of a fire suppression system manual deployment, the fire suppression manifold nozzles will deploy to near ground level and the underbody of the vehicle will be covered with fire suppressant fluid.

**NOTICE:** After system deployment, the fire suppression manifold nozzles may need to be secured in the up position before driving the vehicle through an automatic car wash, or they may come in contact with the automatic car wash components.

The suppressant contains no hazardous materials (but may cause minor skin or eye irritation) and can be readily cleaned up by flushing the vehicle underbody with water, or soap and water. Manual deployment should have no effect on vehicle handling.

**NOTE:** These components must be replaced with new components in the event of a fire suppression system manual deployment. A new fire suppression manual switch must be installed only if the switch cover was damaged during the manual activation.

The fire suppression system consists of the following components:

- Fire Suppression System Module (FSSM)
- Fire suppression manual switch
- Fire suppressors
- Fire suppression manifolds
- Fire suppression system indicator (part of the Instrument Cluster (IC))

### Fire Suppression System Module (FSSM)

**⚠ WARNING:** The tightening torque of the fire suppression system module (FSSM) bolts and the FSSM orientation on the body of the vehicle is critical for correct system operation. Always tighten and orient the FSSM per specifications. Failure to do so may result in incorrect fire suppression system

**operation, which increases the risk that it will not protect vehicle occupant(s).**

The Fire Suppression System Module (FSSM) is mounted underneath the rear seat cushion. The FSSM carries out the following functions:

- Signals the suppressors to deploy the suppressant material in the event of a deployable crash.
- Monitors the fire suppression system for faults.
- Illuminates the fire suppression system indicator if a fault is detected.
- Receives information from the ABS module on the High Speed Controller Area Network (HS-CAN).
- Receives information from the PCM on the HS-CAN .
- Communicates through the ISO 9141 communication network to the Data Link Connector (DLC) any on-demand or continuous memory DTCs, retrieved by the scan tool.

The FSSM monitors the fire suppression system for possible faults. If a fault is detected while the ignition switch is in the ON position, the FSSM will illuminate the fire suppression system indicator located in the IC .

When the ignition switch is cycled (turned off and then on), the fire suppression system indicator remains lit for 6 seconds and then goes out. If a fire suppression fault exists, the fire suppression system indicator flashes or remains lit. The FSSM communicates the on-demand and continuous memory DTCs through the DLC , using the scan tool.


The FSSM includes a backup power supply. This feature provides sufficient backup power to deploy the suppressors in the event that the ignition circuit is damaged in a collision before the suppressors deployment is initiated. The backup power supply will deplete its stored energy approximately one minute after the power is removed from the FSSM .

### **Fire Suppression Manual Switch**

The fire suppression manual switch allows for manual deployment of the suppressors in the event of a fire, when the system has not deployed automatically. Manual activation is possible only when the ignition switch is in the ON position.

The fire suppression manual switch is located in a console on the headliner between the sun visors.

### **Fire Suppressors**

** WARNING: To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.**

The fire suppressors deploy upon receiving voltage from the FSSM .

The fire suppressors are mounted above the rear axle on the No. 4 crossmember.

### **Fire Suppression Manifolds**

The fire suppression manifolds spread the fire suppressant material under the vehicle and around the fuel tank in an event of fire suppression system deployment.

The fire suppression manifolds are mounted on the fire suppressors.

### **Electrical System**





The electrical system that supports the fire suppression system:



- is powered by the battery through the ignition circuit.
  - provides the electrical path from the FSSM to the fire suppressors.
  - provides the electrical path from the fire suppression manual switch to the FSSM .
  - provides the electrical path from the FSSM to the fire suppression system indicator.
  - provides the electrical path from the FSSM to the DLC .
  - provides the electrical path from the FSSM to the PCM.
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**Fire Suppression System****Special Tool(s)**

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2832-A	Diagnostic Tool, Fire Suppression System 501-117
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The Fire Suppression System Module (FSSM) is non-repairable. The FSSM uses hardwired circuitry, internal sensors, internal back-up power supply, the Controller Area Network (CAN), and the ISO 9141 communication network. The circuitry in the 14C369 wiring harness between the FSSM and the LH and RH fire suppressors is contained within a rigid conduit and cannot be repaired. It can only be replaced if it has been damaged. The fire suppression system can be diagnosed with a scan tool through the ISO network. Communication using the CAN circuits transmits and receives data between the FSSM, the PCM, and the ABS module. Refer to [Section 418-00](#).

It is very important to understand:

- where the input originates.
- all the information necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- whether the module which received the input controls the output of the feature, or whether it outputs a message over the CAN circuitry to another module.
- which module controls the output of the feature.

The FSSM detects high velocity rear impacts, determines vehicle motion, and deploys up to 4 suppressor squibs based on vehicle motion requirements. Deployment of the suppressor squibs activates the disbursement of a fire suppression material beneath the rear portion of the vehicle. A rear collision is sensed by 2 impact sensors located inside the FSSM. Vehicle motion after impact is determined based on deceleration and wheel speed. The Vehicle Identification Number (VIN), model year, and wheel speed information is received by the FSSM through the CAN communication network.

If the FSSM detects a concern with any of the fire suppression system components, an indicator in the Instrument Cluster (IC) is illuminated and DTCs are logged.

A manual switch is present as an override to the system. When the manual switch is pressed with the ignition switch in the ON position, voltage and ground are provided to the FSSM , and the FSSM deploys the fire suppressors.

### Inspection and Verification

**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** The tightening torque of the fire suppression system module (FSSM) bolts and the FSSM orientation on the body of the vehicle is critical for correct system operation. Always tighten and orient the FSSM per specifications. Failure to do so may result in incorrect fire suppression system operation, which increases the risk that it will not protect vehicle occupant(s).

1. Verify the customer concern.
2. **NOTE:** If the fire suppression system has been deployed, the following components must be replaced with new components:
  - Fire Suppression System Module (FSSM)
  - Fire suppressors
  - Fire suppression manifolds
  - Fire suppression manual switch (if the plastic cover is damaged)

Visually inspect for obvious signs of mechanical or electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Fire suppression manual switch</li> <li>• Fire suppressors</li> <li>• Fire suppression manifolds</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse 33 (10A)</li> <li>• Wiring, terminals or connectors</li> <li>• Fire suppression manual switch</li> <li>• FSSM</li> <li>• Fire suppressors</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the FSSM .

9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### Fire Suppression System Module (FSSM) DTC Chart

**NOTE:** When the Fire Suppression System Module (FSSM) detects a system fault, it causes the fire suppression system indicator to flash a coded sequence of Lamp Fault Codes (LFCs). The FSSM is capable of communicating an LFC for each specific fault that is present, including each flagged fault of a bit-mapped DTC (except for DTCs B1317 and B1318 for which the indicator remains lit continuously). The LFC is made up of 2 numbers. Each of the 2 numbers is 1 or 2 digits, depending on the fault that is present. The 2 numbers that make up an LFC are separated by a hyphen (-) to clearly distinguish between the 2 numbers. The first number is flashed with a 0.5-second interval between pulses. There is a 2-second pause before the second number is flashed, which also has a 0.5-second interval between pulses. There is a 5-second pause between each display of an LFC and each LFC is flashed 3 times after which the fire suppression system indicator remains lit for the remainder of the key-on cycle.

DTC	LFC	Description	Action
B1231	1-3	Event Threshold Exceeded	The fire suppression system was deployed. INSTALL a new Fire Suppression System Module (FSSM), new LH and RH fire suppressors, new fire suppression manifolds and a new fire suppression manual switch (if the plastic cover is damaged). REFER to <u>Fire Suppression System Module (FSSM)</u> , <u>Fire Suppressor</u> , <u>Fire Suppression Manifold</u> and <u>Fire Suppression Manual Switch</u> in this section. TEST the system for normal operation.
B1317	Continuous	Battery Voltage High	GO to <u>Pinpoint Test K</u> .
B1318	Continuous	Battery Voltage Low	GO to <u>Pinpoint Test L</u> .
B1342	1-2	ECU Is Faulted	INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. TEST the system for normal operation.

B1921	1-4	Air Bag Diagnostic Monitor Ground Circuit Open	REFER to <u>Section 413-01</u> .
B2477	5-4	Module Configuration Failure	INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. TEST the system for normal operation.
B2792	12-11	Cross Link Between Firing Loops	<u>GO to Pinpoint Test I</u> .
B2900	11-8	VIN Mismatch	<u>GO to Pinpoint Test A</u> .
B299A	1-9	Suppressor Left Circuit Open - Loop # 1	<u>GO to Pinpoint Test B</u> .
B299B	8-7	Suppressor Left Circuit Short to Battery - Loop # 1	<u>GO to Pinpoint Test E</u> .
B299C	8-3	Suppressor Left Circuit Short to Ground - Loop # 1	<u>GO to Pinpoint Test F</u> .
B299E	8-11	Suppressor Left Circuit Resistance Low on Squib - Loop # 1	<u>GO to Pinpoint Test H</u> .
B299F	8-1	Suppressor Left Circuit Open - Loop # 2	<u>GO to Pinpoint Test D</u> .
B29A0	8-8	Suppressor Left Circuit Short to Battery - Loop # 2	INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. TEST the system for normal operation.
B29A1	8-4	Suppressor Left Circuit Short to Ground - Loop # 2	<u>GO to Pinpoint Test G</u> .
B29A3	8-12	Suppressor Left Circuit Resistance Low on Squib - Loop # 2	<u>GO to Pinpoint Test G</u> .
B29A4	2-1	Suppressor Right Circuit Open - Loop # 1	<u>GO to Pinpoint Test C</u> .
B29A5	8-9	Suppressor Right Circuit Short to Battery - Loop # 1	<u>GO to Pinpoint Test E</u> .
B29A6	8-5	Suppressor Right Circuit Short to Ground - Loop # 1	<u>GO to Pinpoint Test F</u> .
B29A8	8-13	Suppressor Right Circuit Resistance Low on Squib - Loop # 1	<u>GO to Pinpoint Test H</u> .
B29A9	8-2	Suppressor Right Circuit Open - Loop # 2	<u>GO to Pinpoint Test D</u> .
B29AA	8-10	Suppressor Right Circuit Short to Battery - Loop # 2	INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. TEST the system for normal operation.
B29AB	8-6	Suppressor Right Circuit Short to Ground - Loop # 2	<u>GO to Pinpoint Test G</u> .

B29AD	8-14	Suppressor Right Circuit Resistance Low on Squib - Loop # 2	<u>GO to Pinpoint Test G</u> .
B29AE	7-1	Fire Suppression Manual Activation Switch Closed at Key On	CLEAR the DTCs. REPEAT the self-test. If DTC B29AE is retrieved, INSTALL a new fire suppression manual switch. REFER to <u>Fire Suppression Manual Switch</u> in this section. CLEAR the DTCs. REPEAT the self-test.
B29AF	5-1	Fire Suppression Manual Activation Switch High Side Circuit Failure	<u>GO to Pinpoint Test J</u> .
B29B0	7-9	Fire Suppression Manual Activation Switch High Side Circuit Short to Battery	<u>GO to Pinpoint Test J</u> .
B29B1	5-2	Fire Suppression Manual Activation Switch Low Side Circuit Failure	<u>GO to Pinpoint Test J</u> .
B29B2	7-2	Fire Suppression Manual Activation Switch Low Side Circuit Short to Ground	<u>GO to Pinpoint Test J</u> .
B29B3	None	Fire Suppression Indicator Lamp Circuit Failure	REFER to <u>Section 413-01</u> .
B29B4	None	Fire Suppression Indicator Lamp Circuit Short to Battery	REFER to <u>Section 413-01</u> .
P0630	11-8	VIN Not Programmed or Incompatible - ECM /PCM	<u>GO to Pinpoint Test A</u> .
U1900	1-6	CAN Communication Bus Fault - Receive Error	If any ABS module DTCs are present, REFER to <u>Section 206-09</u> . If no ABS module DTCs are present, REFER to <u>Section 418-00</u> .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: DTCs B2900 and P0630

**Normal Operation**

The Fire Suppression System Module (FSSM) monitors the communication for a police package specific vehicle ID. If an unexpected Vehicle Identification Number (VIN) or an unprogrammed VIN is detected, the FSSM stores DTC B2900 and/or P0630 in continuous memory.

- DTC B2900 ( VIN Mismatch) - sets when the FSSM detects a VIN that is unexpected.
- DTC P0630 ( VIN Not Programmed or Incompatible - ECM /PCM) - sets when the FSSM detects an unexpected or un-programmed VIN .

**This pinpoint test is intended to diagnose the following:**

- PCM configuration
- Controller Area Network (CAN) communication bus
- FSSM

**PINPOINT TEST A: DTCs B2900 AND P0630**

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
<b>A1 CHECK THE CAN COMMUNICATION</b>	
<ul style="list-style-type: none"> <li>• Review the recorded DTCs from the FSSM self-test.</li> <li>• <b>Is DTC U1900 present?</b></li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE VIN</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Access the PCM VIN .</li> <li>• <b>Does the PCM display the correct VIN ?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> CONFIGURE the PCM with the correct VIN . REFER to <u>Section 418-01</u> . CLEAR the DTCs. REPEAT the self-test.</p>

**Pinpoint Test B: DTC B299A**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) checks all of the LH fire suppressor circuits for faults. If the FSSM detects an open on the LH fire suppressor squib 1 circuits, it stores DTC B299A in continuous memory and illuminates the fire suppression system indicator.

- DTC B299A (Suppressor Left Circuit Open - Loop #1) - sets when the FSSM detects an open on the LH fire suppressor squib 1 circuits 2312 and 2313. This DTC causes the fire suppression system

indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LH fire suppressor
- FSSM

#### PINPOINT TEST B: DTC B299A

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

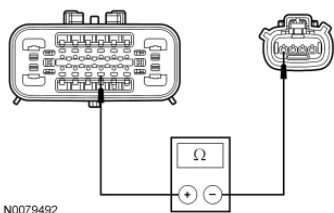
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

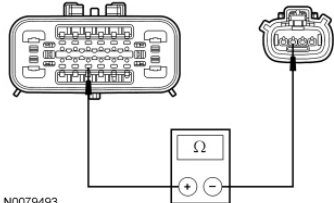
**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01.

Test Step	Result / Action to Take
<b>B1 CHECK FOR AN ON-DEMAND DTC OR A CONTINUOUS MEMORY DTC</b>	
<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• Was DTC B299A retrieved as an on-demand DTC during the self-test?</li> </ul>	<p><b>Yes</b> GO to <u>B2</u>.</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder frequently. REPEAT the self-test.</p>
<b>B2 CHECK THE FSSM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING:</b> To reduce the risk of accidental deployment, do</li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable.</p>



<p><b>not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></p> <ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: Inline C339.</li> <li>• Install the fire suppression system diagnostic tool to the inline C339, body harness side.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B299E and B29A8 are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool installed on the inline C339. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299E or DTC B29A8 is retrieved with the diagnostic tool disconnected, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B299E retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p>WAIT 60 seconds for the fire suppression system backup power supply to deplete. REMOVE the fire suppression system diagnostic tool. GO to <u>B4</u> .</p> <p><b>No</b> GO to <u>B3</u> .</p>
<p><b>B3 CHECK THE LH FIRE SUPPRESSOR SQUIB CIRCUITS FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: FSSM C3281a.</li> <li>• Disconnect: Inline C339.</li> <li>• Measure the resistance between the FSSM C3281a-4, circuit 2313 (BK/WH), harness side and the inline C339-4, circuit 2313 (BK/WH), body harness side.</li> </ul>  <p>N0079492</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-5, circuit 2312 (LG), harness side and the inline C339-3, circuit 2312 (LG), body harness side.</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>B6</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the FSSM C3281a and the inline C339. CONNECT the negative battery cable. GO to <u>B5</u> .</p>

 <p>N0079493</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>B4 CHECK THE LH FIRE SUPPRESSOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LH Fire Suppressor C4317.</li> <li>• Install the fire suppression system diagnostic tool to the LH fire suppressor C4317, harness side.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B299E and B29A3 are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool installed on the LH fire suppressor C4317. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299E or DTC B29A3 is retrieved with the diagnostic tool disconnected, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B299E retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <u>B5</u> .</p> <p><b>No</b> INSTALL a new fire suppression system harness. GO to <u>B5</u> .</p>
<b>B5 CHECK FOR ADDITIONAL DTCs</b>	
<ul style="list-style-type: none"> <li>• Refer to the continuous memory DTCs recorded during Step B1.</li> <li>• <b>Were any additional continuous memory DTCs retrieved during Step B1?</b></li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>
<b>B6 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test C: DTC B29A4**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) checks all of the RH fire suppressor circuits for faults. If the FSSM detects an open on the RH fire suppressor squib 1 circuits, it stores DTC B29A4 in continuous memory and illuminates the fire suppression system indicator.

- DTC B29A4 (Suppressor Right Circuit Open - Loop #1) - sets when the FSSM detects an open on the RH fire suppressor squib 1 circuits 2310 and 2311. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RH fire suppressor
- FSSM

**PINPOINT TEST C: DTC B29A4**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

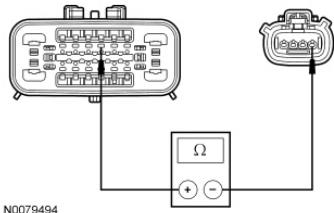
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

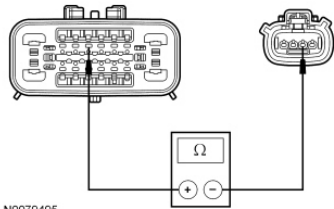
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>C1 CHECK FOR ON-DEMAND OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B29A4 retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder</p>

	frequently. REPEAT the self-test.
<b>C2 CHECK THE FSSM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the FSSM back-up power supply to discharge.</li> <li>• Disconnect: Inline C339.</li> <li>• Install the fire suppression system diagnostic tool to the inline C339, body harness side.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B299E and B29A8 are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool installed on the inline C339. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299E or DTC B29A8 is retrieved with the diagnostic tool disconnected, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B29A8 retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REMOVE the fire suppression system diagnostic tool. GO to <u>C4</u> .</p> <p><b>No</b> GO to <u>C3</u> .</p>
<b>C3 CHECK THE RH FIRE SUPPRESSOR SQUIB CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: FSSM C3281a.</li> <li>• Disconnect: Inline C339.</li> <li>• Measure the resistance between the FSSM C3281a-12, circuit 2310 (OG), harness side and the inline C339-1, circuit 2310 (OG), body harness side.</li> </ul>	<p><b>Yes</b> GO to <u>C6</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the FSSM C3281a and the inline C339. CONNECT the negative battery cable. GO to <u>C5</u> .</p>
 <p>N0079494</p>	

<ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-13, circuit 2311 (DG), harness side and the inline C339-2, circuit 2311 (DG), body harness side.</li> </ul>  <p>N0079495</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	
<b>C4 CHECK THE RH FIRE SUPPRESSOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RH Fire Suppressor C4316.</li> <li>• Install the fire suppression system diagnostic tool to the RH fire suppressor C4316, harness side.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B29A8 and B29AD are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool installed on the RH fire suppressor C4316. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299E or DTC B29A8 is retrieved with the diagnostic tool disconnected, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B29A8 retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <u>C5</u> .</p> <p><b>No</b> INSTALL a new fire suppression system harness. GO to <u>C5</u> .</p>
<b>C5 CHECK FOR ADDITIONAL DTCs</b>	
<ul style="list-style-type: none"> <li>• Refer to the continuous memory DTCs recorded during Step C1.</li> <li>• <b>Were any additional continuous memory DTCs retrieved during Step C1?</b></li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>
<b>C6 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test D: DTCs B299F and B29A9**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

### Normal Operation

The Fire Suppression System Module (FSSM) checks all of the fire suppressor circuits for faults. If the FSSM detects an open on the LH fire suppressor squib 2 circuits, it stores DTC B299F in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects an open on the RH fire suppressor squib 2 circuits, it stores DTC B29A9 in continuous memory and illuminates the fire suppression system indicator.

- DTC B299F (Suppressor Left Circuit Open - Loop #2) - sets when the FSSM detects an open on the LH fire suppressor squib 2 circuits 2328 (OG) and 2329 (DG). This DTC causes the fire suppression system indicator to illuminate.
- DTC B29A9 (Suppressor Right Circuit Open - Loop #2) - sets when the FSSM detects an open on the RH fire suppressor squib 2 circuits 2326 and 2327. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RH fire suppressor
- LH fire suppressor
- FSSM

### PINPOINT TEST D: DTCs B299F AND B29A9

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>D1 CHECK FOR ON-DEMAND OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• Is DTC B299F or DTC B29A9 retrieved as an on-demand DTC during the self-test?</li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent</p>

	<p>fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder frequently. REPEAT the self-test.</p>
<b>D2 CHECK THE FSSM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: FSSM C3281b.</li> <li>• Connect the fire suppression system diagnostic tool to the FSSM C3281b connector, component side.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B29A3 and B29AD are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool connected into the FSSM C3281B connector. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B29A3 or DTC B29AD is retrieved with the diagnostic tool disconnected, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Were DTCs B29A3 and B29AD retrieved as on-demand DTCs during the self-test?</b></li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. DISCONNECT the fire suppression system diagnostic tool. CONNECT the FSSM C3281b. CONNECT the negative battery cable. CLEAR DTCs B29A3 and B29AD. GO to <u>D3</u> .</p> <p><b>No</b> GO to <u>D5</u> .</p>
<b>D3 CHECK THE FIRE SUPPRESSORS</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• <b>⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: Suspect Fire Suppressor.</li> <li>• Connect the fire suppression system diagnostic tool to the suspect fire suppressor, harness side.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Enter the following diagnostic mode on the scan tool: Self-Test.</li> <li>• <b>NOTE:</b> DTCs B299E and DTC B29A3 are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool connected into the LH fire suppressor C4317. DTCs B29AD and B29A8 are expected to be retrieved when the self-test is carried out with the fire suppression diagnostic tool connected into the RH fire suppressor C4317. These DTCs can be</li> </ul>	<p><b>Yes</b> If DTC B29A9 was retrieved in Step D1, INSTALL a new RH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <u>D4</u> .</p> <p>If DTC B299F was retrieved in Step D1, INSTALL a new LH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <u>D4</u> .</p> <p><b>No</b> INSTALL a new fire suppression system harness. GO to <u>D4</u> .</p>

<p>cleared once all the fire suppression connections are restored. If DTC B299E, B29A3, B29AD, or B29A8 is retrieved with the diagnostic tool disconnected, refer to DTC Charts in this section.</p> <ul style="list-style-type: none"> <li>• <b>Is DTC B29A8 or DTC B299E retrieved as an on-demand DTC during the self-test?</b></li> </ul>	
<b>D4 CHECK FOR ADDITIONAL DTCs</b>	
<ul style="list-style-type: none"> <li>• Refer to the continuous memory DTCs recorded during Step D1.</li> <li>• <b>Were any continuous memory DTCs retrieved during Step D1?</b></li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>
<b>D5 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test E: DTCs B299B And B29A5

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The Fire Suppression System Module (FSSM) checks all of the fire suppressor circuits for faults. If the FSSM detects a short to voltage on the LH fire suppressor squib 1 circuits, it stores DTC B299B in memory and illuminates the fire suppression system indicator. If the FSSM detects a short to voltage on the RH fire suppressor squib 1 circuits, it stores DTC B29A5 in continuous memory and illuminates the fire suppression system indicator.

- DTC B299B (Suppressor Left Circuit Short to Battery - Loop #1) - sets when the FSSM detects a short to voltage on the left fire suppressor squib 1 circuits 2312 and 2313. This DTC causes the LH suppression system indicator to illuminate.
- DTC B29A5 (Suppressor Right Circuit Short to Battery - Loop #1) - sets when the FSSM detects a short to voltage on the RH fire suppressor squib 1 circuits 2310 and 2311. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- FSSM



**PINPOINT TEST E: DTCs B299B AND B29A5**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>E1 CHECK FOR ON-DEMAND OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>Carry out the FSSM self-test.</li> <li><b>Is DTC B299B or DTC B29A5 retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder frequently. REPEAT the self-test.</p>
<b>E2 CHECK THE FSSM</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li><b>⚠ WARNING:</b> To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</li> <li>Disconnect: Negative Battery Cable.</li> <li>Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>Disconnect: FSSM C3281a.</li> <li>Connect: Negative Battery Cable.</li> <li>Ignition ON.</li> <li>Measure the voltage between the FSSM C3281a, body harness side and ground as follows:</li> </ul>	<p><b>Yes</b> REPAIR the circuit in question. CONNECT the inline C339. CONNECT the negative battery cable. GO to <u>E3</u> .</p> <p><b>No</b> GO to <u>E4</u> .</p>

<table border="1"> <thead> <tr> <th>DTC</th><th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>B299B</td><td>C3281a-5</td><td>2312 (LG)</td></tr> <tr> <td>B299B</td><td>C3281a-4</td><td>2313 (BK/WH)</td></tr> <tr> <td>B29A5</td><td>C3281a-12</td><td>2310 (OG)</td></tr> <tr> <td>B29A5</td><td>C3281a-13</td><td>2311 (DG)</td></tr> </tbody> </table>			DTC	Connector-Pin	Circuit	B299B	C3281a-5	2312 (LG)	B299B	C3281a-4	2313 (BK/WH)	B29A5	C3281a-12	2310 (OG)	B29A5	C3281a-13	2311 (DG)
DTC	Connector-Pin	Circuit															
B299B	C3281a-5	2312 (LG)															
B299B	C3281a-4	2313 (BK/WH)															
B29A5	C3281a-12	2310 (OG)															
B29A5	C3281a-13	2311 (DG)															
<ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>																	
<b>E3 CHECK FOR ADDITIONAL DTCs</b>																	
<ul style="list-style-type: none"> <li>• Refer to the continuous memory DTCs recorded during Step E1.</li> <li>• <b>Were any continuous memory DTCs retrieved during Step E1?</b></li> </ul>		<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>															
<b>E4 CHECK FOR CORRECT FSSM OPERATION</b>																	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>		<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>															

### Pinpoint Test F: DTCs B299C and B29A6

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The Fire Suppression System Module (FSSM) checks all of the fire suppressor circuits for faults. If the FSSM detects a short to ground on the LH fire suppressor squib 1 circuits, it stores DTC B299C in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a short to ground on the RH fire suppressor squib 1 circuits, it stores DTC B29A6 in continuous memory and illuminates the fire suppression system indicator.

- DTC B299C (Suppressor Left Circuit Short to Ground - Loop #1) - sets when the FSSM detects a short to ground on the LH fire suppressor squib 1 circuits 2312 and 2313. This DTC causes the fire suppression system indicator to illuminate.
- DTC B29A6 (Suppressor Right Circuit Short to Ground - Loop #1) - sets when the FSSM detects a short to ground on the RH fire suppressor squib 1 circuits 2310 and 2311. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LH fire suppressor
- RH fire suppressor
- FSSM

**PINPOINT TEST F: DTCs B299C AND B29A6**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>F1 CHECK FOR ON-DEMAND OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• Is DTC B299C or DTC B29A6 retrieved as an on-demand DTC during the self-test?</li> </ul>	<p><b>Yes</b> GO to <u>F2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder frequently. REPEAT the self-test.</p>
<b>F2 CHECK THE LH AND RH SQUIB 1 CIRCUITS FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING:</b> To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</li> </ul>	<p><b>Yes</b> GO to <u>F3</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the FSSM C3281a</p>

- Disconnect: Negative Battery Cable.
- Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.
- Disconnect: Inline C339.
- Disconnect: FSSM C3281a.
- Measure the resistance between the inline C339, body harness side and ground as follows:

DTC	Connector-Pin	Circuit
B299C	C339-3	2312 (LG)
B299C	C339-4	2313 (BK/WH)
B29A6	C339-1	2310 (OG)
B29A6	C339-2	2311 (DG)

- **Are the resistances greater than 10,000 ohms?**

and the inline C339.  
CONNECT the negative battery cable. GO to **F5**.

### F3 CHECK THE FSSM

- Connect: FSSM C3281a.
- Connect: Negative Battery Cable.
- **NOTE:** DTCs B29A4 and B299A are expected to be retrieved when the self-test is carried out with the inline C339 disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B29A4 or DTC B299A is retrieved with all the fire suppression connections restored, refer to DTC Charts in this section.
- Carry out the FSSM self-test.
- **Is DTC B299C or DTC B29A6 retrieved as on-demand DTCs during the self-test?**

**Yes**  
GO to **F6**.

**No**  
DISCONNECT the negative battery cable. CONNECT the inline C339. CONNECT the negative battery cable. CLEAR DTCs B29A4 and B299A. GO to **F4**.

### F4 CHECK THE FIRE SUPPRESSORS

- Disconnect: Negative Battery Cable.
- **⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.**
- Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.
- Disconnect: Suspect Fire Suppressor.
- Disconnect: Inline C339.
- Connect: Negative Battery Cable.
- Clear the FSSM DTCs.
- **NOTE:** DTCs B299A and B299F are expected to be retrieved when the self-test is carried out with the LH fire suppressor C4317 disconnected. DTCs B29A9 and B29A4 are expected to be retrieved when the self-test is carried out with the RH fire suppressor C4316 disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299A, B299F, B29A9, or B29A4 is retrieved with all the fire suppression connections restored, refer to DTC Charts in this

**Yes**  
INSTALL a new fire suppression system harness. GO to **F5**.

**No**  
If DTC B29A6 was retrieved in Step F1, INSTALL a new RH fire suppressor. REFER to **Fire Suppressor** in this section. GO to **F5**.

If DTC B299C was retrieved in Step F1, INSTALL a new LH fire suppressor. REFER to **Fire Suppressor** in this section. GO to **F5**.

section. • Carry out the FSSM self-test. • <b>Is DTC B299C or DTC B29A6 retrieved as an on-demand DTC during the self-test?</b>	
<b>F5 CHECK FOR ADDITIONAL DTCs</b>	
• Refer to the continuous memory DTCs recorded during Step F1. • <b>Were any continuous memory DTCs retrieved during Step F1?</b>	<b>Yes</b> REFER to DTC Charts in this section.  <b>No</b> CLEAR the DTCs. REPEAT the self-test.
<b>F6 CHECK FOR CORRECT FSSM OPERATION</b>	
• Disconnect all the FSSM connectors. • Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> • Connect all the FSSM connectors and make sure they seat correctly. • Operate the system and verify the concern is still present. • <b>Is the concern still present?</b>	<b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.  <b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

### Pinpoint Test G: DTCs B29A1, B29AB, B29A3 and B29AD

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The Fire Suppression System Module (FSSM) checks all of the fire suppressor circuits for faults. If the FSSM detects a short to ground on the LH fire suppressor squib 2 circuits, it stores DTC B29A1 in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a low resistance condition between the LH fire suppressor squib 2 circuits, it stores DTC B29A3 in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a short to ground on the RH fire suppressor squib 2 circuits, it stores DTC B29AB in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a low resistance condition between the RH fire suppressor squib 2 circuits, it stores DTC B29AD in continuous memory and illuminates the fire suppression system indicator.

DTC Description	Fault Trigger Conditions
• B29A1 - Suppressor Left Circuit Short to Ground - Loop #2	Sets when the FSSM detects a short to ground on the LH fire suppressor squib 2 circuits 2328 and 2329. This DTC causes the fire suppression system indicator to illuminate.
• B29AB - Suppressor Right Circuit Short to	Sets when the FSSM detects a short to ground on the RH fire suppressor squib 2 circuits 2326 and 2327. This DTC causes the fire suppression system indicator to illuminate.

Ground - Loop #2	
<ul style="list-style-type: none"> <li>• B29A3 - Suppressor Left Circuit Resistance Low on Squib - Loop #2</li> </ul>	Sets when the FSSM detects a low resistance condition on the LH fire suppressor squib 2 circuits 2328 and 2329. This DTC causes the fire suppression system indicator to illuminate.
<ul style="list-style-type: none"> <li>• B29AD - Suppressor Right Circuit Resistance Low on Squib - Loop #2</li> </ul>	Sets when the FSSM detects a low resistance condition on the RH fire suppressor squib 2 circuits 2326 and 2327. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RH fire suppressor
- LH fire suppressor
- FSSM

#### **PINPOINT TEST G: DTCs B29A1, B29AB, B29A3 AND B29AD**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.



**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>G1 CHECK FOR ON-DEMAND DTCs OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• Is DTC B29A1, B29AB, B29A3, or B29AD retrieved as an on-demand DTC during the self-test?</li> </ul>	<p><b>Yes</b> GO to <u>G2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder</p>

	frequently. REPEAT the self-test.
<b>G2 CHECK THE FSSM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: FSSM C3281b.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B299F and B29A9 are expected to be retrieved when the self-test is carried out with the FSSM C3281b disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299F or DTC B29A9 is retrieved with all the fire suppression connections restored, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Is DTC B29A1, B29AB, B29A3, or B29AD retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>G5</u> .</p> <p><b>No</b> GO to <u>G3</u> .</p>
<b>G3 CHECK THE FIRE SUPPRESSORS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Connect: FSSM C3281b.</li> <li>• Disconnect: Suspect Fire Suppressor.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Clear the FSSM DTCs.</li> <li>• <b>NOTE:</b> DTCs B299A and B299F are expected to be retrieved when the self-test is carried out with the LH fire suppressor C4317 disconnected. DTCs B29A4 and B29A9 are expected to be retrieved when the self-test is carried out with the RH fire suppressor C4316 disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299A, B299F, B29A4, or B29A9 is retrieved with all the fire suppression connections restored, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Is DTC B29A1, B29AB, B29A3, or B29AD retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new fire suppression system harness. GO to <u>G4</u> .</p> <p><b>No</b> If DTC B29AB or DTC B29AD was retrieved in Step G1, INSTALL a new RH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <u>G4</u> .</p> <p>If DTC B29A1 or DTC B29A3 was retrieved in Step G1, INSTALL a new LH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <u>G4</u> .</p>
<b>G4 CHECK FOR ADDITIONAL DTCs</b>	
<ul style="list-style-type: none"> <li>• Refer to the continuous memory DTCs recorded during Step G1.</li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p>

<ul style="list-style-type: none"> <li>• Were any continuous memory DTCs retrieved during Step G1?</li> </ul>	<p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>
<b>G5 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test H: DTCs B299E and B29A8**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) checks all of the fire suppressor circuits for faults. If the FSSM detects a low resistance condition between the LH fire suppressor squib 1 circuits, it stores DTC B299E in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a low resistance condition between the RH fire suppressor squib 1 circuits, it stores DTC B29A8 in continuous memory and illuminates the fire suppression system indicator.

- DTC B299E (Suppressor Left Circuit Resistance Low on Squib - Loop #1) - sets when the FSSM detects a low resistance condition on the LH fire suppressor squib 1 circuits 2312 and 2313. This DTC causes the fire suppression system indicator to illuminate.
- DTC B29A8 (Suppressor Right Circuit Resistance Low on Squib - Loop #1) - sets when the FSSM detects a low resistance condition on the RH fire suppressor squib 1 circuits 2310 and 2311. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LH fire suppressor
- RH fire suppressor
- FSSM

**PINPOINT TEST H: DTCs B299E AND B29A8**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.



**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

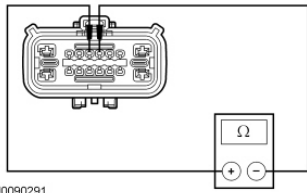
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

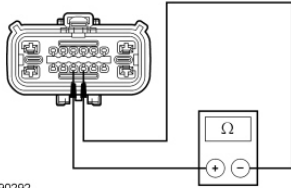
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>H1 CHECK FOR ON-DEMAND DTCs OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>Carry out the FSSM self-test.</li> <li><b>Were DTCs B299E or B29A8 retrieved as on-demand DTCs during the self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder frequently. REPEAT the self-test.</p>
<b>H2 CHECK THE FSSM</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li><b>⚠ WARNING:</b> To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</li> <li>Disconnect: Negative Battery Cable.</li> <li>Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>Disconnect: FSSM C3281a.</li> <li>Measure the resistance between the FSSM C3281a pin 4, component side and the FSSM C3281a pin 5, component side.</li> </ul>	<p><b>Yes</b> For DTC B299E, GO to <u>H3</u> . For DTC B29A8, GO to <u>H4</u> .</p> <p><b>No</b> GO to <u>H7</u> .</p>



N0090291

- Measure the resistance between the FSSM C3281a pin 12, component side and the FSSM C3281a pin 13, component side.

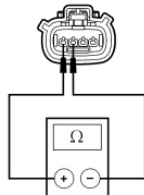


N0090292

- Are the resistances greater than 10,000 ohms?

### H3 CHECK THE LH SUPPRESSOR SQUIB 1 CIRCUITS FOR LOW RESISTANCE

- Connect: FSSM C3281a.
- Disconnect: Inline C339.
- Measure the resistance between the inline C339-3, circuit 2312 (LG), body harness side and the inline C339-4, circuit 2313 (BK/WH), body harness side.



N0013475

- Is the resistance greater than 10,000 ohms?

**Yes**  
GO to H5 .

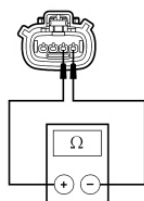
**No**  
REPAIR circuits 2312 (LG) and 2313 (BK/WH). CONNECT the inline C339. CONNECT the negative battery cable. GO to H6 .

### H4 CHECK THE RH SUPPRESSOR SQUIB 1 CIRCUITS FOR LOW RESISTANCE

- Connect: FSSM C3281a.
- Disconnect: Inline C339.
- Measure the resistance between the inline C339-1, circuit 2310 (OG), body harness side and the inline C339-2, circuit 2311 (DG), body harness side.

**Yes**  
GO to H5 .

**No**  
REPAIR circuits 2310 (OG) and 2311 (DG). CONNECT the inline C339. CONNECT the negative battery cable. GO to H6 .



N0013476

- Is the resistance greater than 10,000 ohms?

**H5 CHECK THE FIRE SUPPRESSORS**

- Disconnect: Suspect Fire Suppressor.
- Connect: Negative Battery Cable.
- **NOTE:** DTCs B299A and B299F are expected to be retrieved when the self-test is carried out with the LH fire suppressor C4317 disconnected. DTCs B29A4 and B29A9 are expected to be retrieved when the self-test is carried out with the RH fire suppressor C4316 disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299A, B299F, B29A4, or B29A9 is retrieved with all the fire suppression connections restored, refer to DTC Charts in this section.
- Carry out the FSSM self-test.
- **Is DTC B299E or DTC B29A8 retrieved as an on-demand DTC during the self-test?**

**Yes**

INSTALL a new fire suppression system harness. GO to H6 .

**No**

If DTC B29A8 was retrieved in Step H1, INSTALL a new RH fire suppressor. REFER to Fire Suppressor in this section. GO to H6 .

If DTC B299E was retrieved in Step H1, INSTALL a new LH fire suppressor. REFER to Fire Suppressor in this section. GO to H6 .

**H6 CHECK FOR ADDITIONAL DTCs**

- Refer to the continuous DTCs recorded during Step H1.
- **Were any additional continuous DTCs retrieved during Step H1?**

**Yes**

REFER to DTC Charts in this section.

**No**

CLEAR the DTCs. REPEAT the self-test.

**H7 CHECK FOR CORRECT FSSM OPERATION**

- Disconnect all the FSSM connectors.
- Check for:
  - ◆ corrosion
  - ◆ damaged pins
  - ◆ pushed-out pins
- Connect all the FSSM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

**Yes**

INSTALL a new FSSM . REFER to Fire Suppression System Module (FSSM) in this section. REPEAT the self-test.

**No**

The system is operating correctly at this time. The concern may have been caused by a loose or corroded

**Pinpoint Test I: DTC B2792**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) monitors all of the firing loop circuits for a cross-link (short together) between the circuits of another firing loop. If the FSSM detects a short between the circuits of a firing loop and another firing loop (cross-link), it stores DTC B2792 in continuous memory and illuminates the fire suppression system indicator.

- DTC B2792 (Cross Link Between Firing Loops) - sets when the FSSM detects a short between the circuits of 2 different firing loops (cross-link). This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Short circuit between firing loops
- LH fire suppressor
- RH fire suppressor
- FSSM

**PINPOINT TEST I: DTC B2792 - CROSS LINK BETWEEN FIRING LOOPS**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>I1 CHECK FOR ON-DEMAND OR CONTINUOUS MEMORY DTCs</b>	

<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B2792 retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>I2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the key in the ignition lock cylinder frequently. REPEAT the self-test.</p>										
<b>I2 CHECK THE FSSM FOR CROSSLINK BETWEEN #1 FIRING LOOPS</b>											
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</b></li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: FSSM C3281a.</li> <li>• Measure the resistance between the LH loop and the RH loop FSSM pins, component side, as follows:</li> </ul> <table border="1"> <thead> <tr> <th>FSSM Connector-Pin (LH Loop)</th><th>FSSM Connector-Pin (RH Loop)</th></tr> </thead> <tbody> <tr> <td>C3281a-4</td><td>C3281a-12</td></tr> <tr> <td>C3281a-4</td><td>C3281a-13</td></tr> <tr> <td>C3281a-5</td><td>C3281a-12</td></tr> <tr> <td>C3281a-5</td><td>C3281a-13</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	FSSM Connector-Pin (LH Loop)	FSSM Connector-Pin (RH Loop)	C3281a-4	C3281a-12	C3281a-4	C3281a-13	C3281a-5	C3281a-12	C3281a-5	C3281a-13	<p><b>Yes</b> GO to <u>I3</u> .</p> <p><b>No</b> GO to <u>I7</u> .</p>
FSSM Connector-Pin (LH Loop)	FSSM Connector-Pin (RH Loop)										
C3281a-4	C3281a-12										
C3281a-4	C3281a-13										
C3281a-5	C3281a-12										
C3281a-5	C3281a-13										
<b>I3 CHECK THE BODY HARNESS CIRCUITS FOR CROSSLINK</b>											
<ul style="list-style-type: none"> <li>• Connect: FSSM C3281a.</li> <li>• Disconnect: Inline C339.</li> <li>• Measure the resistance between the inline C339 pins (LH loop and the RH loop), body harness side as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Inline Connector-Pin (LH Loop)</th><th>Inline Connector-Pin (RH Loop)</th></tr> </thead> <tbody> <tr> <td>C339-3</td><td>C339-1</td></tr> <tr> <td>C339-3</td><td>C339-2</td></tr> </tbody> </table>	Inline Connector-Pin (LH Loop)	Inline Connector-Pin (RH Loop)	C339-3	C339-1	C339-3	C339-2	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> REPAIR the circuit(s) in question. CONNECT the inline C339. CONNECT the negative battery cable. GO to <u>I6</u> .</p>				
Inline Connector-Pin (LH Loop)	Inline Connector-Pin (RH Loop)										
C339-3	C339-1										
C339-3	C339-2										

C339-4	C339-1	
C339-4	C339-2	
<ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>		
<b>I4 CHECK THE LH FIRE SUPPRESSORS</b>		
<ul style="list-style-type: none"> <li>• Connect: Inline C339.</li> <li>• Disconnect: LH Fire Suppressor C4317.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B299A and B299F are expected to be retrieved when the self-test is carried out with the LH fire suppressor C4317 disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B299A or DTC B299F is retrieved with all the fire suppression connections restored, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B2792 retrieved as an on-demand DTC during the self-test?</b></li> </ul>		<p><b>Yes</b> DISCONNECT the negative battery cable. CONNECT the LH fire suppressor C4317. GO to <b>I5</b> .</p> <p><b>No</b> INSTALL a new LH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <b>I6</b> .</p>
<b>I5 CHECK THE RH FIRE SUPPRESSORS</b>		
<ul style="list-style-type: none"> <li>• Disconnect: RH Fire Suppressor C4316.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>NOTE:</b> DTCs B29A9 and B29A4 are expected to be retrieved when the self-test is carried out with the RH fire suppressor C4316 disconnected. These DTCs can be cleared once all the fire suppression connections are restored. If DTC B29A9 or DTC B29A4 is retrieved with all the fire suppression connections restored, refer to DTC Charts in this section.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Was DTC B2792 retrieved as an on-demand DTC during the self-test?</b></li> </ul>		<p><b>Yes</b> INSTALL a new fire suppression system harness. GO to <b>I6</b> .</p> <p><b>No</b> INSTALL a new RH fire suppressor. REFER to <u>Fire Suppressor</u> in this section. GO to <b>I6</b> .</p>
<b>I6 CHECK FOR ADDITIONAL DTCs</b>		
<ul style="list-style-type: none"> <li>• Refer to the continuous memory DTCs recorded during Step I1.</li> <li>• <b>Were any continuous memory DTCs retrieved during Step I1?</b></li> </ul>		<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>
<b>I7 CHECK FOR CORRECT FSSM OPERATION</b>		
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>		<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded</p>

connector.

**Pinpoint Test J: DTCs B29AF, B29B0, B29B1 and B29B2**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) checks the fire suppression manual switch circuits for faults. If the FSSM detects an open or a short to ground on circuit 2315, DTC B29AF is stored in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a short to voltage on circuit 2315, DTC B29B0 is stored in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects an open or a short to voltage on circuit 2314, DTC B29B1 is stored in continuous memory and illuminates the fire suppression system indicator. If the FSSM detects a short to ground on circuit 2314, DTC B29B2 is stored in continuous memory and illuminates the fire suppression system indicator.

DTC Description	Fault Trigger Conditions
<ul style="list-style-type: none"> <li>B29AF - Fire Suppression Manual Activation Switch High Side Circuit Failure</li> </ul>	Sets when the FSSM detects either an open or a short to ground on circuit 2315. This DTC causes the fire suppression system indicator to illuminate.
<ul style="list-style-type: none"> <li>B29B0 - Fire Suppression Manual Activation Switch High Side Circuit Short to Battery</li> </ul>	Sets when the FSSM detects a short to voltage on circuit 2315. This DTC causes the fire suppression system indicator to illuminate.
<ul style="list-style-type: none"> <li>B29B1 - Fire Suppression Manual Activation Switch Low Side Circuit Failure</li> </ul>	Sets when the FSSM detects either an open or a short to voltage on circuit 2314. This DTC causes the fire suppression system indicator to illuminate.
<ul style="list-style-type: none"> <li>B29B2 - Fire Suppression Manual Activation Switch Low Side Circuit Short to Ground</li> </ul>	Sets when the FSSM detects a short to ground on circuit 2314. This DTC causes the fire suppression system indicator to illuminate.

**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Fire suppression manual switch
- Fire suppression manual switch wiring harness
- FSSM

**PINPOINT TEST J: DTCs B29AF, B29B0, B29B1 AND B29B2**

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors,

which may result in serious personal injury.

**⚠ WARNING:** To prevent inadvertent deployment of the fire suppression system (FSS), do not defeat, cut or remove wiring connector shorting bars, including when servicing or removing the system. These wiring connectors incorporate shorting bars to reduce the potential for unintended suppressor activation from static electricity charges. Failure to follow this warning may result in serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>J1 CHECK FOR ON-DEMAND OR CONTINUOUS MEMORY DTCs</b>	
<ul style="list-style-type: none"> <li>• Carry out the FSSM self-test.</li> <li>• <b>Is DTC B29AF, B29B0, B29B1, or B29B2 retrieved as an on-demand DTC during the self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>J2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition lock cylinder frequently. REPEAT the self-test.</p>
<b>J2 CHECK THE FIRE SUPPRESSION MANUAL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING:</b> To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the fire suppression system backup power supply to deplete.</li> <li>• Disconnect: FSSM C3281a.</li> <li>• Disconnect: Inline C919.</li> <li>• While pressing and releasing the fire suppression manual switch, measure the resistance between the inline connector pins, fire suppression manual switch wiring harness side as follows:</li> </ul>	<p><b>Yes</b> For DTC B29AF, GO to <u>J4</u> . For DTC B29B0, GO to <u>J6</u> . For DTC B29B1, GO to <u>J8</u> . For DTC B29B2, GO to <u>J12</u> .</p> <p><b>No</b> GO to <u>J3</u> .</p>



Switch Position	Measurement	Expected Value
Pressed	Between C919-1 and C919-2	Less than 20 ohms
Released	Between C919-1 and C919-2	Between 1,710 and 1,890 ohms
Pressed	Between C919-3 and C919-4	Less than 20 ohms
Released	Between C919-3 and C919-4	Between 1,710 and 1,890 ohms

- Are the resistance values correct?

### J3 CHECK THE FIRE SUPPRESSION MANUAL SWITCH WIRING HARNESS

- Disconnect: Fire Suppression Manual Switch C9034.
- While pressing then releasing the fire suppression manual switch, measure the resistance between the fire suppression manual switch C9034 pins, component side as follows:

Switch Position	Measurement	Expected Value
Pressed	Between C9034-1 and C9034-2	Less than 20 ohms
Released	Between C9034-1 and C9034-2	Between 1,710 and 1,890 ohms
Pressed	Between C9034-3 and C9034-4	Less than 20 ohms
Released	Between C9034-3 and C9034-4	Between 1,710 and 1,890 ohms

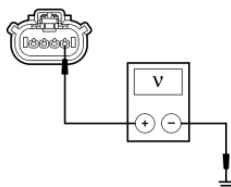
- Are the resistance values correct?

**Yes**  
REPAIR or INSTALL a new fire suppression manual switch wiring harness. GO to **J14**.

**No**  
INSTALL a new fire suppression manual switch. REFER to **Fire Suppression Manual Switch** in this section. GO to **J14**.

### J4 CHECK THE MANUAL SWITCH VOLTAGE SUPPLY

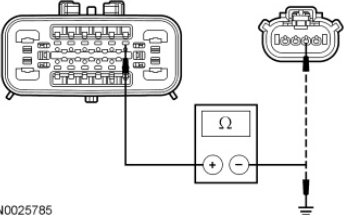
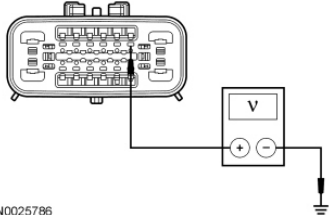
- Connect: Negative Battery Cable.
- Ignition ON.
- Measure the voltage between the inline C919-1, circuit 2319 (RD/YE), body harness side and ground.

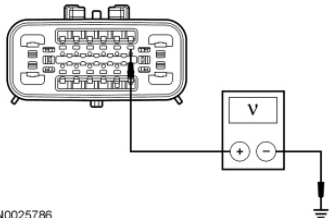
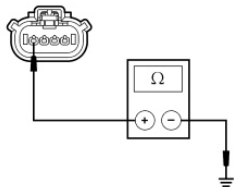
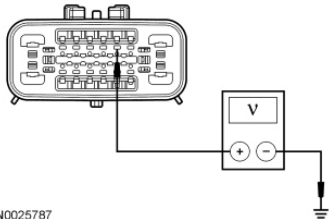


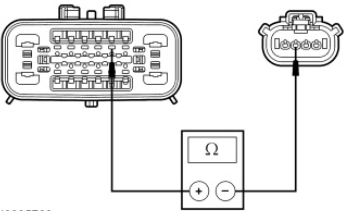
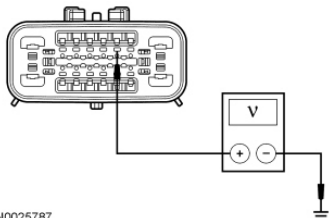
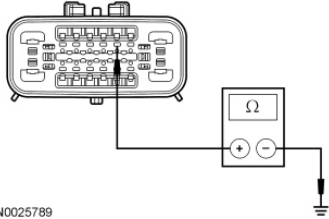
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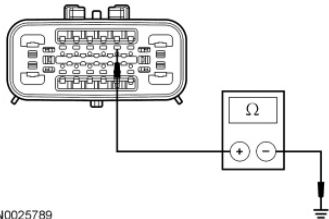
**Yes**  
GO to **J5**.

**No**  
VERIFY the Central Junction Box (CJB) fuse 33 (10A) is OK. If OK, DISCONNECT the negative battery cable. REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to **J14**.

<ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<b>J5 CHECK THE MANUAL SWITCH HIGH CIRCUIT FOR AN OPEN OR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the FSSM C3281a-10, circuit 2315 (BK/PK), harness side and ground; and between the FSSM C3281a-10, circuit 2315 (BK/PK), harness side and the inline C919-2, circuit 2315 (BK/PK), body harness side.</li> </ul>  <p>N0025785</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms between the FSSM and ground, and less than 5 ohms between the FSSM and the inline C919?</li> </ul>	<p><b>Yes</b> GO to <u>J15</u> .</p> <p><b>No</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REPAIR the circuit. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to <u>J14</u> .</p>
<b>J6 CHECK THE MANUAL SWITCH HIGH CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Connect: Negative Battery Cable.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the FSSM C3281a-10, circuit 2315 (BK/PK), harness side and ground.</li> </ul>  <p>N0025786</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REPAIR the circuit. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to <u>J14</u> .</p> <p><b>No</b> GO to <u>J7</u> .</p>
<b>J7 CHECK THE MANUAL SWITCH HIGH CIRCUIT IN THE FIRE SUPPRESSION MANUAL SWITCH WIRING HARNESS FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Inline C919.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the FSSM C3281a-10, circuit 2315 (BK/PK), harness side and ground.</li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REPAIR or INSTALL a new fire suppression manual switch wiring harness. GO to <u>J14</u> .</p> <p><b>No</b></p>

 <p>N0025786</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	GO to <u>J15</u> .
<b>J8 CHECK THE MANUAL SWITCH GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the inline C919-4, circuit 1203 (BK/LB), harness side and ground.</li> </ul>  <p>N0013480</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J9</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to <u>J14</u> .</p>
<b>J9 CHECK THE MANUAL SWITCH LOW CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Connect: Negative Battery Cable.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the FSSM C3281a-11, circuit 2314 (LB/BK), harness side and ground.</li> </ul>  <p>N0025787</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REPAIR the circuit. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to <u>J14</u> .</p> <p><b>No</b> GO to <u>J10</u> .</p>
<b>J10 CHECK THE MANUAL SWITCH LOW CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the FSSM C3281a-11, circuit 2314 (LB/BK), harness side and the inline C919-3, circuit 2314 (LB/BK), body harness side.</li> </ul>	<p><b>Yes</b> GO to <u>J11</u> .</p> <p><b>No</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REPAIR the circuit. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to <u>J14</u> .</p>

 <p>N0025788</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>J11 CHECK THE MANUAL SWITCH LOW CIRCUIT IN THE FIRE SUPPRESSION MANUAL SWITCH WIRING HARNESS FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Connect: Inline C919.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the FSSM C3281a-11, circuit 2314 (LB/BK), harness side and ground.</li> </ul>  <p>N0025787</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> DISCONNECT the negative battery cable. WAIT 60 seconds for the fire suppression system backup power supply to deplete. REPAIR or INSTALL a new fire suppression manual switch wiring harness. GO to <u>J14</u> .</p> <p><b>No</b> GO to <u>J15</u> .</p>
<b>J12 CHECK THE MANUAL SWITCH LOW CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-11, circuit 2314 (LB/BK), harness side and ground.</li> </ul>  <p>N0025789</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J13</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the inline C919. CONNECT the FSSM C3281a. GO to <u>J14</u> .</p>
<b>J13 CHECK THE MANUAL SWITCH LOW CIRCUIT IN THE FIRE SUPPRESSION MANUAL SWITCH WIRING HARNESS FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Connect: Inline C919.</li> <li>• Measure the resistance between the FSSM C3281a-11, circuit 2314 (LB/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>J15</u> .</p> <p><b>No</b> REPAIR or INSTALL a new fire suppression manual switch wiring harness. GO to <u>J14</u> .</p>

 <p>N0025789</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>J14 CHECK FOR ADDITIONAL DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect: Negative Battery Cable.</li> <li>• Refer to the continuous memory DTCs recorded during Step J1.</li> <li>• Were any continuous memory DTCs retrieved during Step J1?</li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> CLEAR the DTCs. REPEAT the self-test.</p>
<b>J15 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>

**Pinpoint Test K: DTC B1317**

Refer to Wiring Diagrams Cell 13 , Power Distribution/SJB for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) monitors the voltage from the battery and sets DTC B1317 in continuous memory and on-demand if the FSSM detects high battery voltage above 18 volts on circuit 2319 or above 17 volts if PCM and ABS messages are not received.

- DTC B1317 (Battery Voltage High) - a continuous memory or on-demand DTC that sets when the FSSM detects battery voltage above 18 volts on circuit 2319 or above 17 volts if PCM and ABS messages are not received.

**This pinpoint test is intended to diagnose the following:**

- Charging system concern
- FSSM

**PINPOINT TEST K: DTC B1317**

**NOTE:** DTC B1317 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
<b>K1 CHECK FOR DTC B1317, B1676 OR P0563 SET IN OTHER MODULES</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: (All CMDTCs) Self-Test.</li> <li>• Retrieve the continuous memory DTCs from all modules.</li> <li>• <b>Is DTC B1317, B1676 or P0563 (PCM) set in more than one module?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <a href="#">K2</a> .</p>
<b>K2 CHECK THE BATTERY VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Turn off all interior/exterior lights and accessories.</li> <li>• Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage.</li> <li>• <b>Does the battery voltage rise to 15.5 volts or higher?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <a href="#">K3</a> .</p>
<b>K3 RECHECK FOR DTC B1317</b>	
<ul style="list-style-type: none"> <li>• Turn the engine off.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: FSSM Self-Test.</li> <li>• Clear the continuous memory DTCs.</li> <li>• Carry out the FSSM self-test.</li> <li>• <b>Is DTC B1317 present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <a href="#">Fire Suppression System Module (FSSM)</a> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating normally at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.</p>

**Pinpoint Test L: DTC B1318**

Refer to Wiring Diagrams Cell [13](#) , Power Distribution/SJB for schematic and connector information.

**Normal Operation**

The Fire Suppression System Module (FSSM) monitors the voltage from the battery and sets DTC B1318 in continuous memory and on-demand if the FSSM detects low battery voltage below 9 volts on circuit 2319 or below 9.5 volts if PCM and ABS messages are not received.

- DTC B1318 (Battery Voltage Low) - a continuous memory or on-demand DTC that sets when the FSSM detects battery voltage below 9 volts on circuit 2319 or below 9.5 volts if PCM and ABS messages are not received.

**This pinpoint test is intended to diagnose the following:**

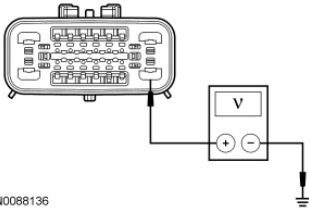
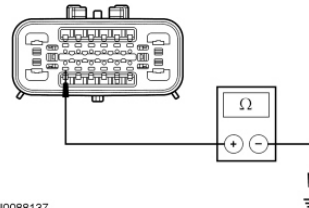
- Wiring, terminals or connectors
- High circuit resistance
- FSSM

**PINPOINT TEST L: DTC B1318**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
<b>L1 RECHECK THE FSSM DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: FSSM Self-Test.</li> <li>• Clear the DTCs. Repeat the FSSM self-test.</li> <li>• <b>Is DTC B1318 still present?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">L2</a> .</p> <p><b>No</b> The system is operating normally at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.</p>
<b>L2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: PCM Self-Test.</li> <li>• Retrieve the continuous memory DTCs from the PCM.</li> <li>• <b>Is DTC P0620, P0625, P0626 or P065B set in the PCM?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> .</p> <p><b>No</b> GO to <a href="#">L3</a> .</p>
<b>L3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the battery condition and verify the battery is fully charged. Refer to <a href="#">Section 414-01</a> .</li> <li>• <b>Is the battery OK and fully charged?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">L4</a> .</p> <p><b>No</b> REFER to <a href="#">Section 414-01</a> .</p>
<b>L4 CHECK THE FSSM VOLTAGE SUPPLY</b>	
<ul style="list-style-type: none"> <li>• Measure and record the voltage at the battery.</li> <li>• Disconnect: FSSM C3281A.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the FSSM C3281A-1, circuit 2319 (RD/YE), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <a href="#">L5</a> .</p> <p><b>No</b> REPAIR the circuit for high resistance. CLEAR the DTCs. REPEAT the self-test.</p>

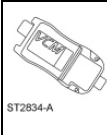
 <p>N0088136</p> <ul style="list-style-type: none"> <li>• Is the voltage within 0.2 volt of the recorded battery voltage?</li> </ul>	
<b>L5 CHECK THE FSSM GROUND CIRCUIT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the FSSM C3281A-7, circuit 1203 (BK/LB), harness side and ground.</li> </ul>  <p>N0088137</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>L6</u> .</p> <p><b>No</b> REPAIR the circuit for high resistance. TEST the system for normal operation.</p>
<b>L6 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the FSSM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Fire Suppression System Module (FSSM)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>





## Fire Suppression System Depowering and Repowering

Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**⚠ WARNING:** The fire suppression system backup power supply must be depleted before lifting the vehicle or when repairing or replacing any of the following:

- Fire suppression system components
- Components located near the fire suppression manual switch
- Fuel tank and components located near the fuel tank
- Rear axle and components located near the rear axle

To deplete the backup power supply, disconnect the battery and wait at least 1 minute. Be sure to disconnect all auxiliary batteries and power supplies (if equipped). Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, disconnect the battery before anyone gets under the vehicle or near the rear axle area. You could unintentionally deploy the fire suppression system. Failure to follow these instructions may result in serious personal injury.

**NOTE:** If a vehicle equipped with a fire suppression system is positioned on a hoist, the fire suppression system must be depowered.

**NOTE:** The fire suppression system indicator illuminates when the Fire Suppression System Module (FSSM) fuse is removed and the ignition switch is ON. This is normal operation and does not indicate a fire suppression system fault.

**NOTE:** The fire suppression system must be fully operational and free of faults before releasing the vehicle to the customer.

### Depowering procedure

1. Turn all vehicle accessories off.
2. Turn the ignition lock cylinder to the OFF position.
3. Remove the Central Junction Box (CJB) fuse 33 (10A). For additional information, refer to Wiring Diagrams Cell 96, Police Option for schematic and connector information.

4. Turn the ignition lock cylinder to the ON position and visually monitor the fire suppression system indicator for at least 30 seconds. The fire suppression system indicator will remain lit continuously (no flashing) if the correct FSSM fuse has been removed. If the fire suppression system indicator does not remain lit continuously, remove the correct FSSM fuse before proceeding to the next step.
5. Turn the ignition lock cylinder to the OFF position.
6. **NOTE:** If battery voltage is required for diagnostic procedures, the battery must be connected **without** installing the FSSM fuse.

Disconnect the battery and any auxiliary batteries and power supplies (if equipped) and wait at least one minute. For additional information, refer to Section 414-01 .

### Repowering procedure

7. Install the CJB fuse 33 (10A) to the CJB and close the cover.
8. **NOTE:** This step is not required if the battery was connected after the depowering procedure was carried out.

Connect the battery. For additional information, refer to Section 414-01 .

9. Prove out the fire suppression system as follows:

Turn the ignition lock cylinder from the OFF to the ON position and visually monitor the fire suppression system indicator. The fire suppression system indicator will light continuously for approximately 6 seconds and then turn off. If a fire suppression system fault is present, the fire suppression system indicator will:

- fail to light.
- remain lit continuously.
- flash.

The flashing might not occur until approximately 30 seconds after the ignition lock cylinder has been turned from the OFF to the ON position. This is the time required for the FSSM to complete the testing of the fire suppression system. If this occurs, the fire suppression system fault discovered must be diagnosed and repaired.

Clear all continuous DTCs from the FSSM using a scan tool.

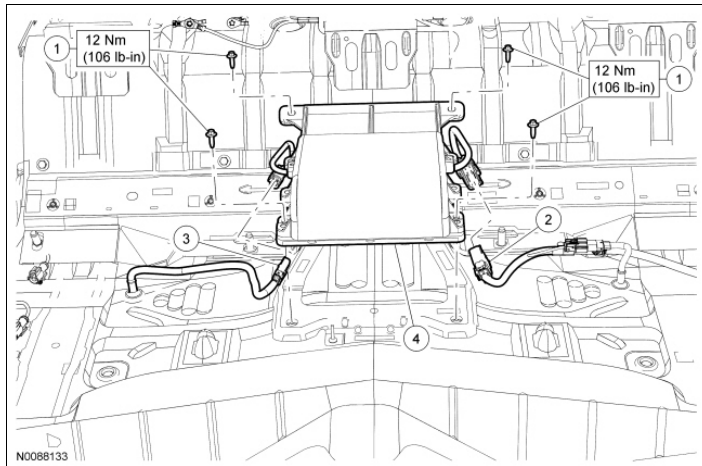
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**Fire Suppression System Module (FSSM)**

**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.



Item	Part Number	Description
1	N808002	Fire Suppression System Module (FSSM) bolts (4 required)
2	-	FSSM electrical connector (part of 14A005)
3	-	FSSM electrical connector (part of 14C369)
4	19H279	FSSM

**Removal and Installation**

1. **⚠ WARNING:** To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, disconnect the battery before anyone gets under the vehicle or near the rear axle area. You could unintentionally deploy the fire suppression system. Failure to follow these instructions may result in serious personal injury.

Disconnect the battery. For additional information, refer to [Section 414-01](#).

2. Remove the rear seat cushion pad and frame.
  1. Apply pressure to the lower front portion of the rear seat cushion pad and frame.
  2. Push the rear seat cushion pad and frame rearward to disengage the rear seat cushion front retainers.
3. **⚠ WARNING:** The tightening torque of the fire suppression system module (FSSM) bolts and the FSSM orientation on the body of the vehicle is critical for correct system operation. Always tighten and orient the FSSM per specifications. Failure to do so may result in incorrect fire

**suppression system operation, which increases the risk that it will not protect vehicle occupant(s).**

Remove the 4 bolts and the Fire Suppression System Module (FSSM).

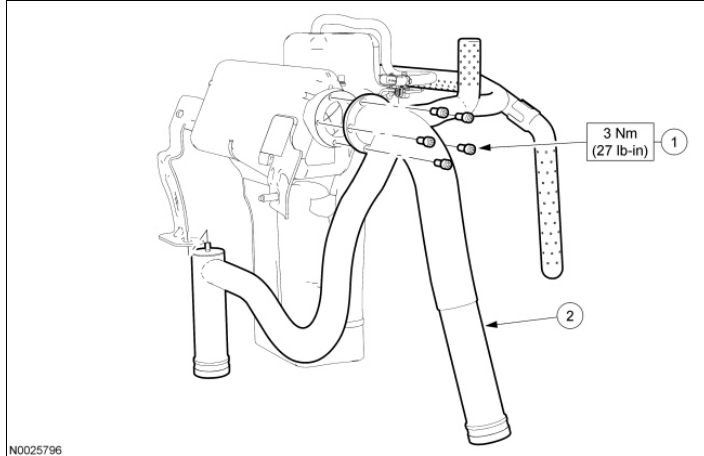
- Disconnect the electrical connectors.
- To install, tighten to 12 Nm (106 lb-in).

4. To install, reverse the removal procedure.

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## Fire Suppression Manifold

**NOTE:** LH side shown, RH side similar.



Item	Part Number	Description
1	-	Fire suppression manifold bolts (5 required) (part of 19H280/19H281)
2	19H280/19H281	Fire suppression manifold (RH/LH)

### Removal and Installation

1. Remove the fire suppressor. For additional information, refer to Fire Suppressor in this section.
2. Remove and discard the 5 fire suppression manifold bolts.
  - **NOTE:** Apply the threadlock material provided in the new manifold kit when installing the new bolts.

To install, tighten to 3 Nm (27 lb-in).

3. **NOTE:** In the event of a fire suppression system deployment, new fire suppression manifolds must be installed.

Remove the fire suppression manifold.

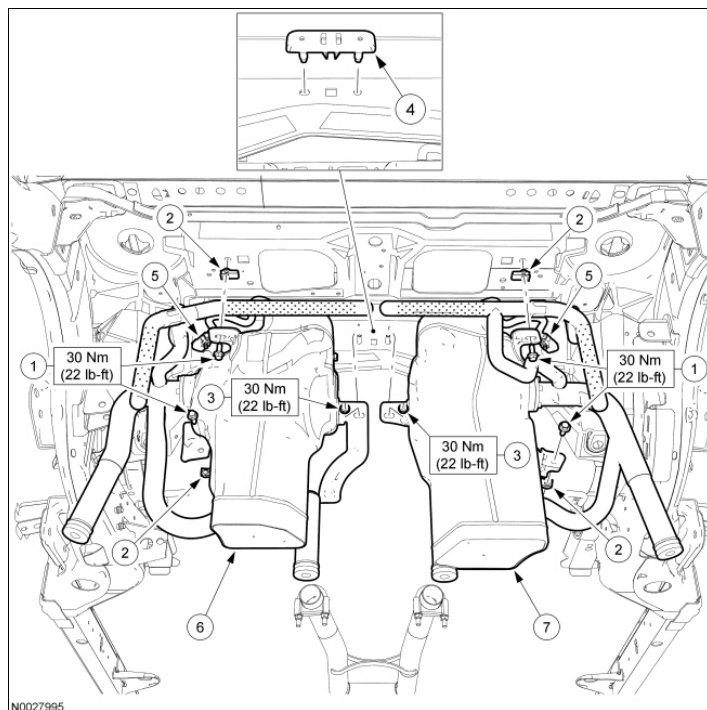
4. To install, reverse the removal procedure.





**Fire Suppressor**

**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.



Item	Part Number	Description
1	W505434-S439	Fire suppressor bolts (2 required each side) (or part of 19H339)
2	W520833-S439	No. 4 crossmember J-nuts (2 required each side) (or part of 19H339)
3	N621940-S439	Fire suppressor retainer nuts (2 required) (or part of 19H339)
4	17E954	Fire suppressor retainer (or part of 19H339)
5	-	Fire suppressor electrical connectors (part of 19H339)
6	19H339	Fire suppressor (LH)
7	19H339	Fire suppressor (RH)

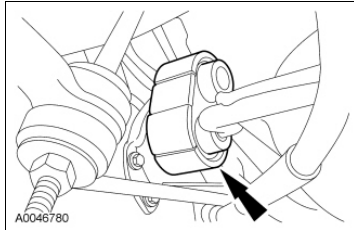
**Removal and Installation**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A.
2. **⚠ WARNING:** To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.

Disconnect the battery. For additional information, refer to Section 414-01.

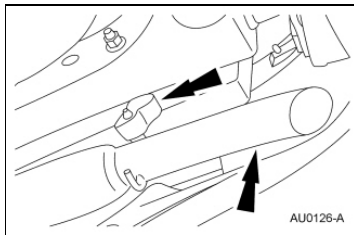
3. Remove the rear suspension lateral arms. For additional information, refer to Section 204-02 .
4. Remove the rear coil springs. For additional information, refer to Section 204-02 .
5. Remove the 2 nuts and the catalytic converter-to-muffler clamp. For additional information, refer to Section 309-00 .
  - To install, tighten to 45 Nm (33 lb-ft).
6. **NOTE:** Check the insulator for wear or damage. Install a new insulator as necessary.

Disconnect the muffler insulator.



7. Remove the tailpipe and muffler assembly.
  - **NOTE:** Check the insulator for wear or damage. Install a new insulator as necessary.

Disconnect the tailpipe insulator.



8. **NOTICE:** Secure the fire suppressor to the transmission jack with a suitable strap.

Support the fire suppressor with a suitable transmission jack.

9. Remove and discard the 2 fire suppressor bolts.
  - To install, tighten to 30 Nm (22 lb-ft).
10. Remove and discard the 2 fire suppressor retainer nuts.
  - To install, tighten to 30 Nm (22 lb-ft).
11. Remove and discard the fire suppressor retainer.
  - Push the tabs to release the retainer from the No. 4 crossmember.
12. **NOTICE:** The fire suppressor electrical connector is located above the No. 4 crossmember. Carefully lower the transmission jack to avoid stressing the fire suppressor wiring harness.

Lower the transmission jack to gain access to the fire suppressor electrical connector.


13. **NOTE:** When connecting the fire suppressor electrical connector, push in the connector until an audible click is heard, then try to disconnect the connector without pressing the locking tab to make sure the connector is fully seated.

Disconnect the fire suppressor electrical connector.

- Push the pin-type retainer to release the fire suppressor connector locator.

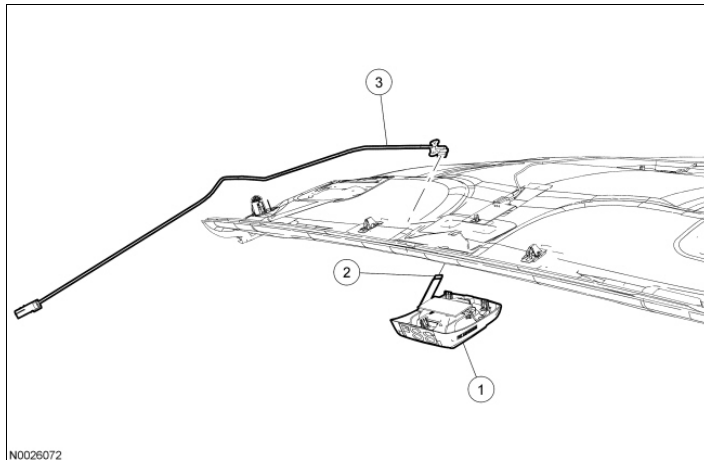
14. Remove the fire suppressor.

15. Remove and discard the two No. 4 crossmember J-nuts.

16.  **WARNING: If the vehicle is equipped with a fire suppression system, disconnect the battery before anyone gets under the vehicle or near the rear axle area. You could unintentionally deploy the fire suppression system. Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure.

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**Fire Suppression Manual Switch**

Item	Part Number	Description
1	54519A70	Fire suppression manual switch
2	-	Fire suppression manual switch electrical connector (part of 54519A70)
3	14334	Fire suppression manual switch harness

**Removal and Installation**

1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. **NOTICE:** Care must be taken when releasing the fire suppression manual switch clips to avoid damaging the switch and the headliner.

Release the fire suppression manual switch from the headliner and position it aside.

3. Position the RH and LH front door weatherstrips aside.
4. Remove the RH and LH windshield side garnish mouldings.
5. Remove the RH and LH sun visors and the center receptacles.
6. **NOTICE:** Care must be taken when lowering the front of the headliner to avoid damaging the headliner.

Lower the front portion of the headliner.

7. Remove the fire suppression manual switch.
  - Disconnect the electrical connector.
8. **NOTICE:** Care must be taken when installing the fire suppression manual switch to avoid folding or pinching the ribbon harness.

To install, reverse the removal procedure.



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## Maintenance Schedules - Gasoline Engines

The maintenance schedule is designed to protect against major repairs resulting from neglect or inadequate maintenance and to prolong the life of the vehicle.

### General Maintenance Information

**NOTE:** This is a generic maintenance schedule for all Ford, Lincoln and Mercury vehicles. There may be items listed that do not apply to all vehicles.

The Normal Schedule applies to operation of the vehicle under typical, everyday driving conditions. The maintenance frequency in this schedule typifies what the vast majority of vehicles will require. The listed services should be carried out at specified mileage, time or hours of operation, whichever occurs first. There are, however, additional services that only the noted vehicles require.

If the vehicle is operated in one or more of the following special operating conditions, those additional services will be required. The special operating conditions are:

- Towing a trailer or using a camper or car-top carrier.
- Extensive idling and/or low-speed driving for long distances as in heavy commercial use such as delivery, taxi, patrol car or livery.
- Driving in dusty conditions such as unpaved or dusty roads.
- Off-road operation.
- Use of E85 fuel 50% of the time or greater (flex fuel vehicles only).

There are also exceptions to the Normal Schedule which will require more frequent maintenance for some components. Those exceptions are:

- Vehicle axle - maintenance and lubrication.
- Police and taxi vehicles - maintenance and lubrication.
- Engine oil and Motorcraft® Coolant - time-based and mileage-based intervals.
- Change brake fluid every 2 years (Class A Motorhome).
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).
- Change spark plugs every 72,000 km (45,000 mi) (Mustang Shelby GT500).
- Change engine oil and filter every 8,000 km (5,000 mi) (F-150 Raptor).
- Tire rotation every 8,000 km (5,000 mi) (F-150 Raptor).

### Engine Idle Hour Meter - Crown Victoria Police Interceptor, Taxi and Executive Series Town Car Equipped with Engine Idle Hour Meter

The vehicle may be equipped with an engine idle hour meter to indicate how much time the vehicle is idling in PARK or NEUTRAL. The engine idle hour meter is incorporated with the vehicle odometer. Depressing the odometer reset button once will display the trip odometer (miles followed by a T for trip odometer). Depressing the odometer reset button a second time will display the engine idle hour meter (hours followed by an H for hours). The engine idle hour meter will only accumulate time when the vehicle is in PARK or NEUTRAL. Displayed time is cumulative for the vehicle and **the engine idle hour meter cannot be reset to zero**. Emergency vehicles, such as police/fire and fleet vehicles, often experience long periods of idling, during which time the engine oil will continue to break down but mileage is not accumulated on the odometer.

To assist fleet managers in maintaining proper oil change intervals, the engine idle hour meter will help determine when an oil change is required. For every hour that the vehicle idles, it has accumulated the equivalent of approximately 53 km (33 mi) of driving. Using the combination of the vehicle odometer and the engine idle hour meter allows the fleet manager to better determine when the oil needs to be changed.

Engine idle hour meter calculation:

- Idle hours x 33 = miles equivalency
- Miles driven + miles equivalency = oil change interval

Example: In metric units, this calculation would be 4,828 km + 3,233 (61 idle hours x 53 km/idle hour) = 8,061 km. When the odometer has accumulated 3,000 miles + 2,013 (61 hours x 33 miles/idle hour) = 5,013 miles, the oil change interval will have been reached.

### Special Operating Condition Requirements

#### When towing a trailer or using a camper or car-top carrier:

- Change engine oil and install a new oil filter every 8,000 km (5,000 mi) or 6 months.
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise every 8,000 km (5,000 mi). Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Change automatic transmission fluid (except TorqShift® transmissions) every 48,000 km (30,000 mi). Change automatic transmission filter (except 6F35/6F55/AWF-21) following Normal Schedule.
- Change transfer case fluid every 96,000 km (60,000 mi).
- Change manual transmission fluid every 96,000 km (60,000 mi).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings as required.
- Replace wheel bearing grease and install new grease seals on Rear Wheel Drive (RWD) front wheel bearings (if non-sealed bearings) every 48,000 km (30,000 mi).

#### Extensive idling and/or low speed driving for long distances, as in heavy commercial use such as delivery, taxi, patrol car or livery:

- Change engine oil and install a new oil filter every 8,000 km (5,000 mi), 6 months or every 200 hours of engine operation.
- Install a new cabin air filter as required (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise every 8,000 km (5,000 mi). Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Inspect brake system every 8,000 km (5,000 mi).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings every 8,000 km (5,000 mi) or 6 months (if equipped).
- Install a new fuel filter every 24,000 km (15,000 mi) on Crown Victoria, Grand Marquis, Town Car, Mustang, Ranger, F-Super Duty, Expedition EL and Navigator EL (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Change automatic transmission fluid (except TorqShift® transmissions) every 48,000 km (30,000 mi). Change automatic transmission filter (except 6F35/6F55/AWF-21) following Normal Schedule.
- Replace wheel bearing grease and install new grease seals on RWD front wheel bearings (if non-sealed bearings) every 48,000 km (30,000 mi).

## 2010 Crown Victoria, Grand Marquis Workshop Manual

- Install new spark plugs every 96,000 km (60,000 mi).
- Change transfer case fluid every 96,000 km (60,000 mi).

### **When operating in dusty conditions such as unpaved or dusty roads:**

- Change engine oil and install a new oil filter every 8,000 km (5,000 mi) or 6 months.
- Install a new cabin air filter as required (if equipped).
- Install a new engine air filter as required.
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise every 8,000 km (5,000 mi). Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings every 8,000 km (5,000 mi) or 6 months (if equipped).
- Install a new fuel filter every 24,000 km (15,000 mi) on Crown Victoria, Grand Marquis, Town Car, Mustang, Ranger, F-Super Duty, Expedition EL and Navigator EL (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Change automatic transmission fluid (except TorqShift® transmissions) every 48,000 km (30,000 mi). Change automatic transmission filter (except 6F35/6F55/AWF-21) following Normal Schedule.
- Replace wheel bearing grease and install new grease seals on RWD front wheel bearings (if non-sealed bearings) every 48,000 km (30,000 mi).
- Change manual transmission fluid every 80,000 km (50,000 mi).
- Change rear axle lubricant every 80,000 km (50,000 mi) (E-450 and F-450/550 only).
- Change transfer case fluid every 96,000 km (60,000 mi).

### **When operating in off-road conditions:**

- Change engine oil and install a new oil filter every 8,000 km (5,000 mi) or 6 months.
- Install a new cabin air filter as required (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise every 8,000 km (5,000 mi) or 6 months. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings as required.
- Change automatic transmission fluid (except TorqShift® transmissions) every 48,000 km (30,000 mi). Change automatic transmission filter (except 6F35/6F55/AWF-21) following Normal Schedule.
- Replace wheel bearing grease and install new grease seals on RWD front wheel bearings (if non-sealed bearings) every 48,000 km (30,000 mi).
- Change manual transmission fluid every 80,000 km (50,000 mi).
- Change rear axle lubricant every 80,000 km (50,000 mi) (E-450 and F-450/550 only).
- Change transfer case fluid every 96,000 km (60,000 mi).

### **Use of E85 fuel 50% of the time or greater (flex fuel vehicles only):**

- If run exclusively on E85, fill the fuel tank with a full tank of regular unleaded fuel every 4,800 km (3,000 mi).
- Change engine oil and install a new oil filter every 8,000 km (5,000 mi) or 6 months.
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise every 8,000 km (5,000 mi). Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.



**When operating a Crown Victoria Police Interceptor, taxi or Town Car-Executive series equipped with an engine idle hour meter:**

- Inspect brake system every 8,000 km (5,000 mi).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for play and noise every 8,000 km (5,000 mi). Vehicles with different front-to-rear tire pressure, the tire pressure must be adjusted and the tire pressure sensor trained.
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings every 8,000 km (5,000 mi) or 6 months (if equipped).
- Change engine oil and replace filter every 8,000 km (5,000 mi), 6 months or as indicated by the time/mileage calculation.
- Replace fuel filter every 24,000 km (15,000 mi).
- Change automatic transmission fluid every 48,000 km (30,000 mi).
- Install new spark plugs every 96,000 km (60,000 mi).
- Inspect and replace cabin air filter as required (if equipped).

### **Checks and Services**

Certain basic maintenance checks and inspections should be carried out at specified intervals. Any recognized adverse condition should be corrected as soon as possible.

#### **In-Line, Service-Installed Transmission Fluid Filter (if equipped)**

Some vehicles may be equipped with an in-line, service-installed transmission fluid filter. This filter is installed in the transmission fluid cooler return line. If equipped, install a new in-line filter during transmission fluid change intervals.

#### **Maximum Oil Change Interval (Normal Schedule)**

- 12,000 km (7,500 mi) or 6 months.

#### **Maximum Oil Change Interval (Special Operating Conditions)**

- 8,000 km (5,000 mi), 6 months or 200 hours of engine operation, whichever occurs first.

#### **Engine Coolant Change Interval**

- 6 years or 169,000 km (105,000 mi).
- After initial change: 3 years or 73,000 km (45,000 mi).

### **Multi-Point Inspection**

The following inspections are recommended at every service interval:

- Check and top off fluid levels for brakes, coolant, manual and automatic transmission (if equipped with an underhood fluid level indicator), power steering (if equipped) and window washer fluids.
- Inspect tires for wear and correct air pressure, including spare tire.
- Check exhaust system for leaks, damage, loose parts and foreign material.
- Check battery performance.
- Check operation of horn, exterior lamps, turn signals and hazard warning lights.
- Check radiator, coolers, heater and A/C hoses.
- Inspect windshield wiper spray and wiper operation.

- Check windshield for cracks, chips and pitting.
- Inspect for oil and fluid leaks.
- Inspect halfshaft dust boots (if equipped).
- Check shocks, struts and other suspension components for leaks and damage.
- Inspect steering and linkage.
- Inspect accessory drive belt(s).
- Inspect clutch operation (if equipped).

### Monthly Checks

Check each of the following items every month:

- All interior and exterior lights for correct operation.
- Tires for wear and correct air pressure, including spare tire.
- Engine oil fluid level.
- Windshield washer solvent fluid level.

### Six Month Checks

Check each of the following items at least every 6 months:

- Lap/shoulder belts and seat latches for wear and function.
- External mounted spare tire is stowed correctly (tight to body).
- Power steering fluid level (if equipped).
- Washer spray, wiper operation and clean all wiper blades (install new wiper blades as necessary).
- Parking brake for correct operation.
- Lubricate all hinges, latches, door check straps and outside locks.
- Lubricate upper and lower sliding door tracks (if equipped).
- Clean sliding door contact switches (if equipped).
- Lubricate door rubber weatherstrips.
- Clean body and door drain holes.
- Safety warning lamps (brake, ABS, air bag, safety belt) for correct operation.
- Coolant system fluid level and correct strength.
- Battery connections. Clean if necessary.
- Clutch fluid level, if equipped.

### Retighten Lug Nuts

The following check procedures should be carried out for all cars, minivans, light trucks, sport utilities, vans and Four-Wheel Drive (4WD) vehicles.

- Retighten the wheel nuts to the specified torque at 160 km (100 mi) after any wheel disturbance (tire rotation, changing a flat tire or wheel removal).
- On vehicles equipped with dual rear wheels, retighten the wheel nuts to the specified torque at 160 km (100 mi) and again at 800 km (500 mi) of new vehicle operation or after any wheel disturbance (tire rotation, changing a flat tire or wheel removal).

### Normal Schedule

#### 12,000 km (7,500 mi)

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).

- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**24,000 km (15,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**36,000 km (22,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**48,000 km (30,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Install a new engine air filter.
- Install new climate controlled seat cushion filters (if equipped).
- Install a new fuel filter on Crown Victoria, Grand Marquis, Town Car and Mustang (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, Focus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.

- Inspect engine cooling system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**60,000 km (37,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**72,000 km (45,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**84,000 km (52,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**96,000 km (60,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Install a new engine air filter.
- Install new climate controlled seat cushion filters (if equipped).

## 2010 Crown Victoria, Grand Marquis Workshop Manual

- Install a new fuel filter on Crown Victoria, Grand Marquis, Town Car and Mustang (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, Focus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Change automatic transmission fluid and filter on all vehicles equipped with the TorqShift® transmission.
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Replace wheel bearing grease and install new grease seals on RWD front wheel bearings (if non-sealed bearings).
- Inspect brake pads, rotors, brake linings, drums, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

### 108,000 km (67,500 mi)

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

### 120,000 km (75,000 mi)

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect brake pads, rotors, brake linings, drums, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

### 132,000 km (82,500 mi)

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor

training must be done.

**144,000 km (90,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Install a new engine air filter.
- Install new climate controlled seat cushion filters (if equipped).
- Install a new fuel filter on Crown Victoria, Grand Marquis, Town Car and Mustang (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, Focus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Install new spark plugs.
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect accessory drive belt(s).
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**156,000 km (97,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**168,000 km (105,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Change rear axle fluid on vehicles equipped with DANA axles which use synthetic lubricants.
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.

- Change engine coolant.
- Inspect engine coolant system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**180,000 km (112,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**192,000 km (120,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Install a new engine air filter.
- Install new climate controlled seat cushion filters (if equipped).
- Install a new fuel filter on Crown Victoria, Grand Marquis, Town Car and Mustang (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, Focus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Change automatic transmission fluid and filter on all vehicles equipped with the TorqShift® transmission.
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Replace wheel bearing grease and install new grease seals on RWD front wheel bearings (if non-sealed bearings).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect accessory drive belts.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**204,000 km (127,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**216,000 km (135,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Inspect automatic transmission fluid level (if equipped with an underhood fluid level indicator).
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.
- Inspect engine cooling system and hoses.
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

**228,000 km (142,500 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Inspect cabin air filter (if equipped).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.

**240,000 km (150,000 mi)**

- Change engine oil and install a new oil filter.
- Perform multi-point inspection (recommended).
- Rotate tires, inspect tires for wear, measure tread depth and inspect wheel ends for end play and noise. Vehicles with dual rear wheels should only be rotated if unusual wear is noted. For vehicles with different front-to-rear tire pressures, the tire pressure must be adjusted and the tire pressure sensor training must be done.
- Install a new cabin air filter (if equipped).
- Install a new engine air filter.
- Install new climate controlled seat cushion filters (if equipped).
- Install a new fuel filter on Crown Victoria, Grand Marquis, Town Car and Mustang (not required for Fusion, Milan, MKZ, Edge, MKX, Taurus, Focus, E-Series, Expedition and Navigator with short wheelbase, F-150, Flex, MKS, Escape, Mariner, F-Series [non-Super Duty] and Transit Connect).
- Change automatic transmission fluid and filter (except for 6F35, 6F50, AWF-21, FNR5 and TorqShift® transmissions).
- Change manual transmission fluid (if equipped).
- Change transfer case fluid, 4WD (if equipped).
- Change front differential fluid, 4WD (if equipped).
- Replace rear axle lubricant on all RWD vehicles.
- Inspect and lubricate control arms, steering linkage, steering ball joints, U-joints and driveshaft with zerk fittings (if equipped).
- Inspect halfshaft boots (if equipped).
- Inspect and lubricate 4WD front axle shaft U-joints (if equipped).
- Install new front wheel bearings (if not sealed units).



## 2010 Crown Victoria, Grand Marquis Workshop Manual

- Inspect brake pads, rotors, brake linings, drums, brake lines, hoses and parking brake system.
- Change engine coolant.
- Inspect engine cooling system and hoses.
- Install a new accessory drive belt(s) (if a new belt(s) has not been installed within the last 160,000 km [100,000 mi]).
- Inspect exhaust system and heat shields.
- Check the rear spring U-bolt nuts for correct torque every 24,000 km (15,000 mi) (Transit Connect).

### Exceptions To Normal Schedule

#### Maximum Oil Change Interval

- Normal schedule: 12,000 km (7,500 mi) or 6 months, whichever occurs first.
- Special operating conditions: 8,000 km (5,000 mi), 6 months or 200 hours of operation, whichever occurs first.

#### Motorcraft® Coolant

- Change engine coolant at 6 years or 168,000 km (105,000 mi) of the vehicle's life, whichever occurs first.
- After the initial change, change coolant every 3 years or 72,000 km (45,000 mi) thereafter.

#### Normal Vehicle Axle Maintenance

Rear axles and transfer case/Power Transfer Unit (PTU) containing synthetic lubricant and light duty trucks equipped with Ford-design axles are lubricated for life. These lubricants are not to be checked or changed unless service is required, or if a leak is suspected or the axle assembly has been submerged in water.

The axle and transfer case/ PTU fluid should be changed anytime they have been submerged in water. Non-synthetic rear axle lubricants should be installed new every 4,800 km (3,000 mi) or 3 months, whichever occurs first, during extended trailer tow operation above 21°C (70°F) ambient and Wide Open Throttle (WOT) for extended periods above 72 km/h (45 mph).

The 4,800 km (3,000 mi) lube change interval may be waived if the axle was filled with 75W-140 synthetic gear lubricant. Add 118 ml (4 oz) of additive friction modifier for complete refill of Traction-Lok rear axles.

The axle lubricant should be changed anytime an axle has been submerged in water.

#### Police and Taxi Vehicle Axle Maintenance

Install new rear axle lubricant every 160,000 km (100,000 mi). Rear axle lubricant change may be waived if the axle was filled with 75W-140 synthetic gear lubricant. Add 118 ml (4 oz) of additive friction modifier for complete refill of Traction-Lok rear axles.

The axle lubricant should be changed anytime an axle has been submerged in water.

#### California Fuel Filter Replacement

If the vehicle is registered in California, the California Air Resources Board has determined that the failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion of the vehicle's useful life. Ford Motor Company, however, urges you to have all recommended maintenance services performed at the specified intervals and to record all vehicle service.

**F-150 Raptor (See Maintenance Schedule - SVT Raptor)**

- Every 8,000 km (5,000 mi) change oil and filter.
- Every 8,000 km (5,000 mi) rotate tires.

**Mustang Shelby GT500**

- Every 8,000 km (5,000 mi) rotate tires.
  - Every 72,000 km (45,000 mi) replace spark plugs.
-

**Noise, Vibration and Harshness (NVH)**

Noise is any undesirable sound, usually unpleasant in nature. Vibration is any motion, shaking or trembling, that can be felt or seen when an object moves back and forth or up and down. Harshness is a ride quality issue where the vehicle's response to the road transmits sharply to the customer. Harshness normally describes a firmer than usual response from the suspension system. NVH is a term used to describe these conditions, which result in varying degrees of dissatisfaction. Although a certain level of NVH caused by road and environmental conditions is normal, this section is designed to aid in the diagnosis, testing and repair of NVH symptoms.

**Acceptable NVH**

All internal combustion engines and drivelines produce some noise and vibration; operating in a real world environment adds noise that is not subject to control. Vibration isolators, mufflers and dampers reduce these to acceptable levels. A driver who is unfamiliar with a vehicle can think that some sounds are abnormal when actually the sounds are normal for the vehicle type. As a technician, it is very important to be familiar with vehicle features and know how they relate to NVH symptoms and their diagnosis. For example, if the vehicle has automatic overdrive, it is important to test drive the vehicle both in and out of overdrive mode.

**Glossary of Terms****Amplitude**

The quantity or amount of energy produced by a vibrating component (G-force). An extreme vibration has a high amplitude. A mild vibration has a low amplitude. See Intensity.

**Boom**

Low frequency or low pitched noise often accompanied by a vibration. Also refer to Drumming.

**Buffet/Buffering**

Strong noise fluctuations caused by gusting winds. An example would be wind gusts against the side glass.

**Buzz**

A low-pitched sound like that from a bee. Often a metallic or hard plastic humming sound. Also describes a high-frequency vibration. Vibration feels similar to an electric razor.

**Chatter**

A pronounced series of rapidly repeating rattling or clicking sounds.

**Chirp**

A short-duration, high-pitched noise associated with a slipping drive belt.

**Chuckle**

A repetitious, low-pitched sound. A loud chuckle is usually described as a knock.

**Click**

A sharp, brief, non-resonant sound, similar to actuating a ball point pen.

**Clonk**

A hydraulic knocking sound. Sound occurs with air pockets in a hydraulic system. Also described as hammering.

**Clunk/Driveline Clunk**

A heavy or dull, short-duration, low-frequency sound. Occurs mostly on a vehicle that is accelerating or decelerating abruptly. Also described as a thunk.

**Conductor**

The components that carry (transmit) a vibration frequency from the originator to the reactor.

**Cycles Per Second**

Cycles per second. Same as hertz (Hz).

**Cracks**

A mid-frequency sound, related to squeak. Sound varies with temperature conditions.

**Creak**

A metallic squeak.

**Cycle**

The process of a vibrating component going through a complete range of motion and returning to the starting point.

**Decibel (dB)**

A unit of measurement, referring to sound pressure level, abbreviated dB.

**Drone**

A low-frequency, steady sound, like a freezer compressor. Also described as a moan.

**Drumming**

A cycling, low-frequency, rhythmic noise often accompanied by a sensation of pressure on the ear drums. Also described as a low rumble, boom or rolling thunder.

**Flutter**

Mid to high intermittent sound due to air flow. Similar to a flag flapping in the wind.

**Frequency**

The rate at which a cycle occurs within a given time.

**G-force**

The additional load or weight produced in an object during acceleration. When measuring the level or amplitude of a vibration without sound, the unit G is added to associate the force of the vibration to gravity. This is similar to measuring the weight of an object, which is also a function of gravity.

**Gravelly Feel**

A grinding or growl in a component, similar to the feel experienced when driving on gravel.

**Grind**

An abrasive sound, similar to using a grinding wheel, or rubbing sand paper against wood.

**Hertz (Hz)**

A unit of measure used to describe noise and vibration concerns expressed in cycles per second.

**Hiss**

Steady, high-frequency noise. Vacuum leak sound.

**Hoot**

A steady, low-frequency tone, sounds like blowing over a long neck bottle.

**Howl**

A mid-range frequency noise between drumming and whine. Also described as a hum.

**Hum**

Mid-frequency steady sound, like a small fan motor. Also described as a howl.

**Intensity**

The physical quality of sound that relates to the strength of the vibration (measured in decibels). The higher the sound's amplitude, the higher the intensity and vice versa. See Amplitude.

**Knock**

A heavy, loud, repetitious sound, like a knock on the door.

**Moan**

A constant, low-frequency tone. Also described as a hum.

**Ping**

A short-duration, high-frequency sound, which has a slight echo.

**Pitch**

The physical quality of sound that relates to its frequency. Pitch increases as frequency increases and vice versa.

**Pumping Feel**

A slow, pulsing movement.

**Rattle**

A random and momentary or short-duration noise.

**Reactor**

The component, or part, that receives a vibration from an originator and conductor and reacts to the vibration by moving.

**Roughness**

A medium-frequency vibration. A slightly higher frequency than a shake. This type of vibration is usually related to drivetrain components.

**Rustling**

Intermittent sound of varying frequency, sounds similar to shuffling through leaves.

**Shake**

A low-frequency vibration, usually with visible component movement. Usually relates to tires, wheels, brake drums or brake discs if it is vehicle speed sensitive, or engine if it is engine speed sensitive. Also referred to as a shimmy or wobble.

**Shimmy**

An abnormal vibration or wobbling, felt as a side-to-side motion of the steering wheel in the driveshaft rotation. Also described as waddle.

**Shudder**

A low-frequency vibration that is felt through the steering wheel or seat during light brake application.

**Slap**

A resonance from flat surfaces, such as safety belt webbing or door trim panels.

**Squeak**

A high-pitched transient sound, similar to rubbing fingers against a clean window.

**Squeal**

A long-duration, high-pitched noise.

**Tap**

A light, rhythmic or intermittent hammering sound, similar to tapping a pencil on a table edge.

**Thump**

A dull beat caused by 2 items striking together.

**Tick**

A rhythmic tap, similar to a clock noise.

**Tip-In Moan**

A light moaning noise heard during light vehicle acceleration, usually between 40-100 km/h (25-65 mph).

**Transient**

A noise or vibration that is momentary, a short duration.

**Vibration**

Any motion, shaking or trembling, that can be felt or seen when an object moves back and forth or up and down.

**Whine**

A constant, high-pitched noise. Also described as a screech.

**Whistle**

High-pitched noise with a very narrow frequency band. Examples of whistle noises are a turbocharger or air flow around an antenna.

**Wind Noise**

Any noise caused by air movement in, out or around the vehicle.



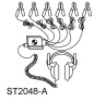



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**Noise, Vibration and Harshness (NVH)**

## Special Tool(s)

	Electronic Vibration Analyzer (EVA) 100-F027 (014-00344) or equivalent
	EngineEAR 107-R2100 or equivalent
	EngineEAR/ChassisEAR 107-R2102 or equivalent
	Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) 257-00018 or equivalent
	Squeak and Rattle Repair Kit 164-R4900
	Ultrasonic Leak Detector 134-R0135 or equivalent

**Diagnostic Theory**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

The shortest route to an accurate diagnosis results from:

- system knowledge, including comparison with a known good system.
- system history, including repair history and usage patterns.
- condition history, especially any relationship to repairs or sudden change.
- knowledge of possible sources.
- using a systematic diagnostic method that divides the system into related areas.

The diagnosis and correction of NVH symptoms requires:

- a road or system test to determine the exact nature of the symptom.
- an analysis of the possible causes.
- testing to verify the cause.
- repairing any symptoms found.
- a road test or system test to make sure the cause has been corrected or brought back to within an acceptable range.

## Diagnostic Procedure Overview

Qualifying the symptom by the particular sensation present can help narrow down the cause. Always use the "symptom" to "system" to "component" to "cause" diagnosis technique. This diagnostic method divides the problem into related areas to correct the customer concern.

- Verify the "symptom".
- Determine which "system(s)" can cause the "symptom" using the diagnostic tools described in this section.
- After determining the possible "system(s)", refer to the appropriate section in this manual to identify the worn or damaged "components".
- After identifying the "components", identify the "cause" of the failure.

## Tools and Techniques

The diagnostic tools allow for a systematic collection of information that is necessary to accurately diagnose and repair NVH problems. Remember that the vibrating source component (originator) may only generate a small vibration. This small vibration can in turn cause a larger vibration/noise to emanate from another receiving component (reactor), due to contact with other components (transfer path). For the best results, carry out the test as follows:

- a. Test drive the vehicle with the vibration sensor inside the vehicle.
- b. Place the sensor in the vehicle according to feel.
  - ◆ If the condition is felt through the steering wheel, the source is most likely in the front of the vehicle.
  - ◆ A vibration that is felt in the seat or floor only will most likely be found in the driveline, drive axle or rear wheels and tires.
- c. Record the readings. Also note when the condition begins, when it reaches maximum intensity and if it tends to diminish above/below a certain speed.
  - ◆ If a vibration symptom is vehicle speed related, the tire and wheel rpm/frequency and driveshaft frequency should be calculated.
  - ◆ If a vibration symptom is engine speed related, the engine, engine accessory and engine firing frequencies should be calculated.
  - ◆ Frequencies with an amplitude reading of 0.06 Gs or less are barely perceptible NVH levels. No corrective action is necessary.
- d. Place the vibration sensor on or near the suspect area outside the vehicle.
- e. Continue the road test, driving the vehicle at the speed the symptom occurs, and take another reading.
- f. Compare the readings.
  - ◆ A match in frequency indicates the problem component or area.
  - ◆ An unmatched test could indicate the symptom is caused by the engine, torque converter or engine accessory. Use the diagnostic tools in the rpm mode and check if the symptom is rpm related.

The following diagnostic tools and techniques can be used separately or in conjunction with each other to aid in the diagnosis of NVH symptoms. They are listed in order of preference for ease in their use for locating these symptoms.

### NVH Analyzer (Vetronix)

The Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) and the MTS 4100 NVH analyzers are tools to aid in the identification and isolation of a noise, vibration or harshness symptom in a vehicle. They measure noise and vibration data and compare it with data obtained from the vehicle's PCM as well as vehicle variants that were entered by the user such as pulley size, axle ratio and tire size in order to provide possible sources. The Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer

(Vetronix) and the MTS 4100 have the following characteristics:

- Interface with the vehicle computer system
- Support and store vibration data input from 1 or 2 accelerometers
- Support and store noise data input from 2 microphones
- Provide a photo-tachometer for operation of the driveshaft balancing function
- Provide a strobe output capable of driving a standard timing light
- Contain a real-time clock circuit that provides time and date information which is used for tagging test data
- Have the capability to print to an external printer and interface with a PC
- Can be powered from a variety of power sources: cigarette lighter, AC power or the internal battery pack

The Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) and the MTS 4100 NVH analyzers have 4 main operating modes. The first is for vibration diagnosis. This mode measures data from 1 or 2 accelerometers simultaneously while obtaining data from the vehicle. Then it carries out a frequency analysis on the accelerometer information and compares the vibration frequencies with the frequencies associated with various rotating components within the vehicle. The data can be presented in 4 different display modes: principle component, bar chart, frequency spectrum or waterfall. All display mode formats contain the same common elements, such as amplitude.

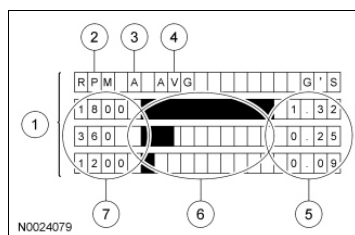
The second is for noise diagnosis. This mode measures noise from 1 or 2 microphones simultaneously. All noise measurements are in decibels (dBs). All frequency bands used for noise measurements are the same as for the vibration measurements, up to 1,000 Hz.

The third is driveshaft balancing. Driveshaft balancing is done using 1 or 2 accelerometers and a photo-tachometer. The accelerometers measure the vibration at both ends of the driveshaft, while the photo-tachometer measures the rotation speed and position reference. Refer to [Section 205-00](#).

The fourth is the strobe. A strobe or standard timing light can be connected to an analyzer, to provide a means for measuring rotation speed. The strobe function is used for isolating the source of a vibration.

### Electronic Vibration Analyzer (EVA)

The Electronic Vibration Analyzer (EVA) is a hand-held electronic scan tool which will assist in locating the source of unacceptable vibrations. The vibration sensor can be remotely mounted anywhere in the vehicle for testing purposes. The unit displays the 3 most common vibration frequencies and their corresponding amplitudes simultaneously. A bar graph provides a visual reference of the relative signal strength (amplitude) of each vibration being displayed and its relative G-force. The keypad is arranged to make the EVA simple to program and use. Some of the functions include the ability to average readings as well as record, play back and freeze readings. The EVA has a strobe balancing function that can be used to detect imbalance on rotating components such as a driveshaft or engine accessories.



Item	Description
1	Electronic Vibration Analyzer (EVA) screen

2	Frequency mode displayed in rpm or Hz
3	Active sensor input (A or B)
4	Current active mode
5	G-force indicators or the strongest frequencies in descending strength of each vibration
6	Strength of each vibration
7	Frequency in rpm/Hz of each vibration

Record the readings taken with the diagnostic tool.

- ◆ Frequencies should be read in the "average" mode.
- ◆ Frequencies have a range of plus or minus 2 Hz. A reading of 10 Hz can be displayed as an 8 Hz through 12 Hz.

### **Vibrate Software®**

Vibrate Software® (Rotunda tool number 215-00003) is a diagnostic aid which will assist in pinpointing the source of unacceptable vibrations. The engine's crankshaft is the point of reference for vibration diagnosis. Every rotating component will have an angular velocity that is faster, slower or the same as the engine's crankshaft. Vibrate Software® calculates the angular velocity of each component and graphically represents these velocities on a computer screen and on a printed vibration worksheet. The following steps outline how Vibrate Software® helps diagnose a vibration symptom:

- Enter the vehicle information. Vibrate will do all the calculations and display a graph showing tire, driveshaft and engine vibrations.
- Print a Vibration Worksheet graph. The printed graph is to be used during the road test.
- Road test the vehicle at the speed where the vibration is most noticeable. Record the vibration frequency rpm and the engine rpm on the worksheet graph. The point on the graph where the vibration frequency rpm reading and the engine rpm reading intersect indicates the specific component group causing the symptom.
  - ◆ A frequency measurement tool capable of measuring vibration frequency and engine rpm will be needed.
- Provides graphics of diagnostic procedures to aid in testing components.

### **Reed Tachometer**

The Reed tachometer is a hand-held vibration sensor which will assist in locating the source of unacceptable vibrations. The vibration sensor can be placed anywhere in the vehicle for testing purposes. The Reed tachometer contains several reeds that are tuned to vibrate or resonate at different frequencies ranging from 10 to 80 Hz or 600 to 4,800 rpm. Though the Reed tachometer is able to measure multiple frequencies, it does not measure amplitude.

### **Sirometer**

The Sirometer measures frequency in hertz and rpm. To use the Sirometer, place it on any vibrating component and slowly scroll the wire out by turning the knob. As the length of wire changes, so does its natural frequency. Find the length of wire that vibrates with the highest amplitude. This frequency will match that of the vibrating component. Read the frequency for that length of wire.

### **Combination EngineEAR/ChassisEAR**

An electronic listening device used to quickly identify noise and the location under the chassis while the vehicle is being road tested. The EngineEAR/ChassisEAR can identify the noise and location of damaged/worn wheel bearings, CV joints, brakes, springs, axle bearings or driveshaft carrier bearings.

### **EngineEAR Basic Unit**

An electronic listening device used to detect even the faintest noises. The EngineEARs can detect the noise of damaged/worn bearings in generators, coolant pumps, A/C compressors and power steering pumps. They are also used to identify noisy lifters, exhaust manifold leaks, chipped gear teeth and for detecting wind noise. The EngineEAR has a sensing tip, amplifier and headphones. The directional sensing tip is used to listen to the various components. Point the sensing tip at the suspect component and adjust the volume with the amplifier. Placing the tip in direct contact with a component will reveal structure-borne noise and vibrations, generated by or passing through, the component. Various volume levels can reveal different sounds.

### **Mechanic's Stethoscope**

A mechanic's stethoscope is an inexpensive tool for locating noises in engines and other moving parts. It can be used to help diagnose piston slap, worn gears, faulty valves, coolant pump failure, damaged gaskets, defective bearings and body squeaks.

### **Squeak and Rattle Repair Kit**

The Squeak and Rattle Repair Kit (Rotunda tool number 164-R4900) contains lubricants and self-adhesive materials that can be used to eliminate interior and exterior squeaks and rattles. The kit consists of the following materials:

- PVC (soft foam) tape
- Urethane (hard foam) tape
- Flocked (black fuzzy) tape
- UHMW (frosted) tape
- Squeak and rattle oil tube
- Squeak and rattle grease tube

### **Ultrasonic Leak Detector**

The Ultrasonic Leak Detector is used to detect wind noises caused by leaks and gaps in areas where there is weatherstripping or other sealing material. It is also used to identify A/C leaks, vacuum leaks and evaporative emission noises. The Ultrasonic Leak Detector includes a multi-directional transmitter (operating in the ultrasonic range) and a hand-held detector. The transmitter is placed inside the vehicle. On the outside of the vehicle, the hand-held detector is used to sweep the area of the suspected leak. As the source of the leak is approached, a beeping sound is produced which increases in both speed and frequency.

### **Write-Up Job Aid**

To assist the service advisor and the technician, a Write-Up Job Aid used during the interview process is included with this material. The Write-Up Job Aid serves as a place to record all important symptom information.

Ford		"WRITE-UP" JOB AID				REPAIR ORDER # _____ CUSTOMER CONCERN # _____			
<b>SPECIFIC SENSE IDENTIFICATION AND LOCATION ON VEHICLE OF CUSTOMER SYMPTOM(S)</b> INSTRUCTIONS: Check below sense affected and location of concern on the generic vehicle illustration (darken the vehicle area). Plus circle appropriate responses to the right.  NOTE: Shaded backgrounds indicate caution areas. Selection of two or more caution areas "flag" difficult repairs in general, shaded areas are the more difficult to verify and repair, and require all applicable columns to be completed.		<b>VEHICLE SYMPTOM AREA</b>	<b>HOW OFTEN?</b>	<b>VEHICLE OPERATING MODE</b>	<b>VEHICLE CONDITIONS</b>	<b>VEHICLE SPEED(mph)</b>	<b>WHEN VEHICLE IS?</b>	<b>AMBIENT CONDITION</b>	
		Front of Vehicle	Always	Start Up	Accessories On	0	Turning Left	Below Zero	
		Engine Compartment	Daily (A.M./P.M.)	Idle	Windows Open	10-19	Over Bumps	Below Freezing (0-19)	
		Dash	Conditional	Gear Selection	4x4	20-29	Up Hills	33-49	
		Steering Wheel	Weekly	Accel Light	Hauling	30-39	Down Hills	50-69	
		Accelerator Pedal	Monthly	Accel Heavy	Towing	40-49	Shifting	70-89	
		Brake Pedal	Intermittent	Steady Speed	Snow Plowing	50-59	Parked	90+	
		Clutch Pedal	Unknown	Deceleration	Other (define below)	60-69	In Traffic	Sunny	
		Seat		Reverse	TEMP	70+		Dry	
		Rear of Vehicle		Stopping/Braking	ENGINE			Windy	
		Top of Vehicle			TEMP			Wet/Humid	
		Floor Pan						Rain	
		Under Vehicle						Snow	
		Other (define below)						Ice	
		<b>DEALER VERIFICATION</b>		<b>WHAT THE CUSTOMER SAID</b>					
		YES NO							
SERVICE ADVISOR									
SHOP FOREMAN									
SERVICE MANAGER									
QC MANAGER									
TECHNICIAN									
VERIFIED WITH CUSTOMER									
<b>OASIS SYMPTOM CODE(S)</b>		<b>VIN NUMBER</b>							

N0029787

## 1: Customer Interview

The diagnostic process starts with the customer interview. The service advisor must obtain as much information as possible about the symptom and take a test drive with the customer. There are many ways a customer will describe NVH symptoms and this will help minimize confusion arising from descriptive language differences. It is important that the symptom is correctly interpreted and the customer descriptions are recorded. During the interview, complete the Write-Up Job Aid and ask the following questions:

- When was it first noticed?
- Did it appear suddenly or gradually?
- Did any abnormal occurrence coincide with or precede its appearance?

Use the information gained from the customer to accurately begin the diagnostic process.

## 2: Pre-Drive Check

It is important to do a pre-drive check before road testing the vehicle. A pre-drive check verifies that the vehicle is relatively safe to drive and eliminates any obvious faults on the vehicle.

The pre-drive check consists of a brief visual inspection. During this brief inspection, take note of anything that will compromise safety during the road test and make those repairs/adjustments before taking the vehicle on the road.

## 3: Preparing for the Road Test

Observe the following when preparing for the road test:

- Review the information recorded on the Write-Up Job Aid. It is important to know the specific symptom the customer has with the vehicle.
- Do not be misled by the reported location of the noise/vibration. The cause can actually be some

distance away.

- Conduct the road test on a quiet street where it is safe to duplicate the noise/vibration. The ideal testing route is an open, low-traffic area where it is possible to operate the vehicle at the speed in which the condition occurs.
- While observing that they are not related to the symptom, eliminate the following:
  - ◆ If possible, lower the radio antenna in order to minimize turbulence.
  - ◆ Identify anything that could potentially make noise or be a source of wind noise.
  - ◆ Inspect the vehicle for add-on items that create noise/vibration.
  - ◆ Turn off the radio and the heating and cooling system blower.
- The engine speed is an important factor in arriving at a final conclusion. Therefore, connect a diagnostic tool, Vetronix, or an accurate tachometer to the engine, even if the vehicle has a tachometer. This will make sure of an exact engine speed reading.

#### 4: Verify the Customer Concern

Verify the customer concern by carrying out a road test, an engine run-up test or both.

The decision to carry out a road test, an engine run-up test or both depends on the type of NVH symptom. A road test may be necessary if the symptom relates to the suspension system or is sensitive to torque. A Drive Engine Run-Up (DERU) or a Neutral Engine Run-Up (NERU) test identifies noises and vibrations relating to engine and drivetrain rpm. Remember, a condition will not always be identifiable by carrying out these tests, however, they will eliminate many possibilities if carried out correctly.

#### 5: Road Test

**NOTE:** It may be necessary to have the customer ride along or drive the vehicle to point out the symptom. During the road test, take into consideration the customer's driving habits and the driving conditions. The customer's concern just may be an acceptable operating condition for that vehicle.

The following is a brief overview of each test in the order in which it appears. A review of this information helps to quickly identify the most appropriate process necessary to make a successful diagnosis. After reviewing this information, select and carry out the appropriate test(s), proceeding to the next step of this process.

- The Slow Acceleration Test is normally the first test to carry out when identifying an NVH symptom, especially when a road test with the customer is not possible.
- The Heavy Acceleration Test helps to determine if the symptom is torque-related.
- The Neutral Coast Down Speed Test helps to determine if the symptom is vehicle speed-related.
- The Downshift Speed Test helps to determine if the symptom is engine speed-related.
- The Steering Input Test helps to determine how the wheel bearings and other suspension components contribute to a vehicle speed-related symptom.
- The Brake Test helps to identify vibrations or noise that are brake related.
- The Road Test Over Bumps helps isolate a noise that occurs when driving over a rough or bumpy surface.
- The Engine Run-Up Tests consist of the Neutral Engine Run-Up (NERU) Test and the Drive Engine Run-Up (DERU) Engine Load Test. These tests help to determine if the symptom is engine speed-related.
- The Neutral Engine Run-Up (NERU) Test is used as a follow-up test to the Downshift Speed Test when the symptom occurs at idle.
- The Drive Engine Run-Up (DERU) Load Test helps to identify vibration/noise sensitive to engine load or torque. It also helps to reproduce engine speed-related symptoms that cannot be duplicated when carrying out the Neutral Engine Run-Up (NERU) Test or the Neutral Coast Down Test.

- The Engine Accessory Test helps to locate faulty belts and accessories that cause engine speed-related symptoms.
- The Vehicle Cold Soak Procedure helps to identify symptoms occurring during initial start-up and when an extended time lapse occurs between vehicle usage.

### **Slow Acceleration Test**

To carry out this test, proceed as follows:

- Slowly accelerate to the speed where the reported symptom occurs. Note the vehicle speed, the engine rpm and, if possible, determine the vibration frequency.
- Attempt to identify from what part of the vehicle the symptom is coming.
- Attempt to identify the source of the symptom.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Heavy Acceleration Test**

To carry out this test, proceed as follows:

- Accelerate hard from 0-64 km/h (0-40 mph).
- Decelerate in a lower gear.
- The symptom is torque related if duplicated while carrying out this test.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Neutral Coast Down Speed Test**

To carry out this test, proceed as follows:

- Drive at a higher rate of speed than where the symptom occurred when carrying out the Slow Acceleration Test.
- Place the transmission in NEUTRAL and coast down past the speed where the symptom occurs.
- The symptom is vehicle speed-related if duplicated while carrying out this test. This eliminates the engine and the torque converter as sources.
- If the symptom was not duplicated while carrying out this test, carry out the Downshift Speed Test to verify if the symptom is engine speed related.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Downshift Speed Test**

To carry out this test, proceed as follows:

- Shift into a lower gear than the gear used when carrying out the Slow Acceleration Test.
- Drive at the engine rpm where the symptom occurs.
- The symptom is engine speed related if duplicated while carrying out this test. This eliminates the



tires, wheels, brakes and the suspension components as sources.

- If necessary, repeat this test using other gears and neutral to verify the results.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Steering Input Test**

To carry out this test, proceed as follows:

- Drive at the speed where the symptom occurs, while making sweeping turns in both directions.
- If the symptom goes away or gets worse, the wheel bearings, hubs, U-joints (contained in the axles of Four-Wheel Drive (4WD) applications), and tire tread wear are all possible sources.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Brake Test**

To carry out this test, proceed as follows:

- With the brake released, accelerate the vehicle. While coasting (brake pedal released) to a stop in NEUTRAL, note any abnormal rate of deceleration. Abnormal deceleration could indicate a parking brake or service brake that is not fully releasing.
- Warm the brakes by slowing the vehicle a few times from 80-32 km/h (50-20 mph) using light braking applications.
- Accelerate to 89-97 km/h (55-60 mph). Moderately apply the brakes and slow the vehicle to a stop.
- A brake vibration can be felt in the steering wheel, seat or brake pedal. A brake noise can be heard upon brake application and should diminish when the brake is released. For vehicles with separate park brake shoes, noise or vibration from the parking brake system will not be affected by applying the hydraulic brakes. On these systems, the parking brake system requires inspection if a parking brake concern is suspected.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate brake section(s) for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Road Test Over Bumps**

To carry out this test, proceed as follows:

- Drive the vehicle over a bump or rough surface one wheel at a time to determine if the noise is coming from the front or the back and the left or the right side of the vehicle.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Neutral Engine Run-Up (NERU) Test**

To carry out this test, proceed as follows:

- Install a tachometer.
- Increase the engine rpm up from an idle to approximately 4,000 rpm while in PARK on Front Wheel Drive (FWD) vehicles with automatic transmissions, or NEUTRAL for all other vehicles. Note the engine rpm and, if possible, determine the vibration frequency.
- Attempt to identify what part of the vehicle the symptom is coming from.
- Attempt to identify the source of the symptom.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### Drive Engine Run-Up (DERU) Load Test

To carry out this test, proceed as follows:

**⚠ WARNING: Block all wheels, set the parking brake and firmly apply the service brake to reduce the risk of vehicle movement during this procedure. Failure to follow these instructions may result in serious personal injury.**

**NOTICE: Do not carry out the Drive Engine Run-Up (DERU) Load Test for more than 5 seconds or damage to the transmission or transaxle may result.**

- Block the front and rear wheels.
- Apply the parking brake and the service brake.
- Install a tachometer.
- Shift the transmission into DRIVE, and increase and decrease the engine rpm between an idle to approximately 2,000 rpm. Note the engine rpm and, if possible, determine the vibration frequency.
- Repeat the test in REVERSE.
- If the vibration/noise is duplicated when carrying out this test, inspect the engine and transmission or transaxle mounts.
- If the symptom is definitely engine speed-related, carry out the Engine Accessory Test to narrow down the source.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### Engine Accessory Test

To carry out this test, proceed as follows:

**⚠ WARNING: Block all wheels, set the parking brake and firmly apply the service brake to reduce the risk of vehicle movement during this procedure. Failure to follow these instructions may result in serious personal injury.**

**NOTICE: Limit engine running time to one minute or less with belts removed or serious engine damage will result.**

**NOTE:** Use a frequency measurement tool to pinpoint accessory vibrations. A listening device, such as an EngineEAR, will also help to identify noises from specific accessories.

- Remove the accessory drive belt(s).
- Increase the engine rpm to where the symptom occurs.
- If the noise/vibration is duplicated when carrying out this test, the belt(s) and accessories are not

sources.

- If the noise/vibration was not duplicated when carrying out this test, install the accessory belt(s), one at a time, to locate the source.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Vehicle Cold Soak Procedure**

To carry out this procedure, proceed as follows:

- Test preparations include matching customer conditions (if known). If not known, document the test conditions: gear selection and engine rpm. Monitor the noise/vibration duration with a watch for up to 3 minutes.
- Park the vehicle where testing will occur. The vehicle must remain at or below the symptom temperature (if known) for 6-8 hours.
- Before starting the engine, conduct a visual inspection under the hood.
- Turn the key ON, but do not start the engine. Listen for the fuel pump, ABS and air suspension system noises.
- Start the engine.
- Isolate the noise/vibration by carefully listening. Move around the vehicle while listening to find the general location of the noise/vibration. Then, search for a more precise location by using a stethoscope or EngineEAR.
- If the source of the symptom has been identified as a result of this test, proceed to the appropriate section for further diagnosis and repair. If the source has not been identified, continue with the road test.

### **Classify NVH Symptom**

For NVH concerns, it is necessary to classify the customer's concern into one of the 3 categories: noise, vibration or harshness. The reason for this is that a customer concern may consist of a combination of symptoms involving noise and vibration, or vibration and harshness. In cases where there are combination symptoms, the technician needs to know which diagnostic path to follow: noise, vibration or harshness. For example, if a customer has a concern involving a noise and a vibration, and it is determined that it is vehicle speed-related, the vibration diagnostic path would be followed.

### **Noise Symptoms**

Once a symptom is classified as a noise, the particular conditions under which the noise occurs need to be identified. These conditions are identified and verified during the road test. For example, a noise may only occur while turning. The next step is to determine which systems on the vehicle are related to that condition. In this case, the steering system and wheel/tire system may be suspect. After identifying possible systems, a preliminary inspection of these systems should be done. If the source of noise is still unidentified, use a listening device (such as the EngineEAR/ChassisEAR) to pinpoint the source. Once the source has been identified, determine if this source is related to the suspected system previously identified. If it is related, then complete the repair to resolve the customer concern. If it is unrelated, then it is possible that the source of the noise is a reactor to a noise being transmitted through a transfer path. If this is the case, repairing the reactor will not resolve the customer concern. The transfer path must be identified and a determination made if the noise is normal, but accentuated by the transfer path (conductor), or if the originator is the fault causing excessive noise to transfer to another component through a conductor. There is a relationship between systems identified as related to conditions and the noise transfer path. In some cases, the condition under which the

noise occurs has nothing to do with the identified source. This relationship is important in the diagnosis of noise concerns. It is the first clue that the identified source of noise might be a reactor and that further investigation is needed to diagnose a possible noise transfer path concern. Based on the results from the road test, make a determination of which action in the Symptom Chart to take first.

## Vibration Symptoms

Most vibrations consist of movements back and forth or up and down that repeat. Every time the vibrating component goes through its complete range of motion and returns to the starting point is called a cycle. The rate at which these cycles occur within a given time is called the frequency. Frequency is measured in cycles per second or Hertz (Hz). One cycle per second equals one Hz. Once the frequency of a vibration is known, calculations can be done to determine the system that is the source of the concern.

## Order of Vibration

The order of a vibration refers to how often the vibration is present in one revolution of the component. For example, a vibration that is present once each revolution of a component would be a first order vibration. A vibration present twice each revolution of the component would be a second order vibration. Vibration orders do not have to be whole numbers, they can have decimal values such as 1.5 order vibration or 3.08 order vibration.

The concept of order of vibration is important to remember when the measured frequency of a vibration does not seem to match the frequency calculations of any of the likely systems or components. As the order increases, the frequency of the vibration will also increase by a multiple of that number.

For example, vibration may be present where the frequency is measured at 14 Hz. After doing the necessary calculations, it is determined the first order tire and wheel frequency is 7 Hz and the first order driveshaft frequency is 22 Hz. Based on this information, it can be determined the vibration is most likely a second order tire and wheel vibration: 7 Hz (first order tire and wheel frequency) multiplied by 2 (second order) equals 14 Hz (second order tire and wheel frequency).

## Relationship of Vibration Frequency to Order of Vibration

After carrying out the road test as described in this section, the vibration was determined to be either vehicle-speed related or engine-speed related. That determination will identify the vibration frequency calculations that should be done.

Vibration Type	Calculate
Vehicle-speed related	Tire-speed vibration frequency
	Driveshaft-speed vibration frequency
Engine-speed related	Engine vibration frequency
	Engine accessory vibration frequency
	Engine firing vibration frequency

In calculating and using frequency readings, it is important to remember the direct relationship between Hz and rpm. One Hz is equal to 60 rpm. This is easy to remember by thinking of Hz as cycles per second. There

are 60 seconds in a minute, therefore multiply the Hz reading by 60 to get rpm. Conversely, rpm would be divided by 60 to get Hz.

Use the Frequency and RPM Calculations Worksheet to calculate system/component frequencies. The worksheet provides the necessary steps to determine each system/component group frequency.

## Frequency Calculations

### Calculating Tire and Wheel Frequency

For a vibration concern, use the vehicle speed to determine tire/wheel frequency and rpm. Calculate tire and wheel rpm and frequency by carrying out the following:

- Measure the diameter of the tire.
- Record the speed at which the vibration occurs.
- Obtain the corresponding tire and wheel rpm and frequency from the Tire Speed and Frequency Chart.
- If the vehicle speed is not listed, calculate the tire and wheel frequency as follows:
  - ◆ Divide the vehicle speed at which the vibration occurs by 16 km/h (10 mph). Multiply that number by the 16 km/h (10 mph) tire rpm listed for that tire diameter in the chart. Then divide that number by 60.
  - ◆ For example, if calculating the frequency based on vehicle speed in km/h for a 64 km/h vibration with 835 mm tires, divide 64 km/h by 16 km/h = 4. Multiply 4 by 105 rpm = 420. Divide 420 by 60 seconds = 7 Hz at 64 km/h.
  - ◆ If calculating the frequency based on vehicle speed in mph for a 40 mph vibration with 33 inch tires, divide 40 mph by 10 mph = 4. Multiply 4 by 105 rpm = 420. Divide 420 by 60 seconds = 7 Hz at 40 mph.
  - ◆ The calculated frequency of 7 Hz is the first order tire and wheel vibration; the second order tire and wheel vibration would be twice this number at 14 Hz; the third order tire and wheel vibration would be 21 Hz; and so on.

### Tire Speed and Frequency Chart

Tire Diameter	Tire RPM/Hz	Tire RPM/Hz	Tire RPM/Hz	Tire RPM/Hz
mm (in)	@ 16 km/h (10 mph)	@ 80 km/h (50 mph)	@ 97 km/h (60 mph)	@ 113 km/h (70 mph)
483 (19)	182	910/15	1,092/18	1,274/21
508 (20)	173	865/14	1,038/17	1,211/20
533 (21)	165	825/14	990/16	1,155/19
560 (22)	158	790/13	948/16	1,106/18
585 (23)	151	755/13	906/15	1,057/18
610 (24)	145	725/12	870/14	1,015/17
635 (25)	139	695/12	834/14	973/16
660 (26)	134	670/11	804/13	938/16
685 (27)	129	645/11	774/13	903/15
710 (28)	124	620/10	744/12	868/14

735 (29)	119	595/10	714/12	833/14
760 (30)	115	575/10	690/11	805/13
785 (31)	111	555/9	666/11	777/13
810 (32)	108	540/9	648/11	756/13
835 (33)	105	525/9	630/10	735/12
864 (34)	102	510/8	612/10	714/12

### Calculating Driveshaft Frequency

Knowing the tire and wheel frequency allows for easy calculation of driveshaft frequency. The driveshaft drives the tires through the rear axle. Therefore, to determine driveshaft frequency, multiply tire and wheel frequency by the ratio of the rear axle. Calculate driveshaft frequency by carrying out the following steps:

- Obtain the axle ratio of the vehicle. Suppose the vehicle has a vibration problem at 64 km/h (40 mph) and a rear axle ratio of 3.08:1.
- Multiply the tire and wheel frequency of 7 Hz (calculated previously) with the rear axle ratio of 3.08:1. This results in a driveshaft frequency of 22 Hz at a vehicle speed of 64 km/h (40 mph).

The calculated frequency of 22 Hz is the first order driveshaft frequency; the second order frequency of the driveshaft is twice this number, or 44 Hz; and so on.

### Calculating Engine Frequency

Use the engine rpm where the vibration symptom occurs to determine engine frequency. Calculate engine frequency by dividing the engine rpm by 60 (the number of seconds in a minute). For example, if the corresponding engine rpm of a vibration concern on a vehicle is 2,400 rpm, the resulting engine frequency is 40 Hz. Therefore, a 40 Hz vibration is a first order engine vibration. For purposes of vibration diagnosis, the engine also includes the torque converter and exhaust system.

### Calculating Engine Accessory Frequency

Belt-driven engine accessories often produce vibrations at different frequencies than the engine itself. This is because the drive ratio created by the different size pulleys causes them to rotate at different speeds. Determining engine accessory frequency is comparable to calculating driveshaft frequency.

Calculate engine accessory frequency by carrying out the following steps:

- Determine the size ratio factor between the accessory pulley and the crankshaft pulley. For example, if the diameter of the crankshaft pulley is 6 inches and the accessory pulley diameter is 2 inches, the accessory pulley rotates 3 times for every crankshaft rotation (6 divided by 2).
- Multiply the engine rpm where the vibration condition occurs by the number of times the accessory pulley is rotating per crankshaft revolution. For example, if the engine rpm is 2,400 rpm, the accessory is rotating at 7,200 rpm (2,400 rpm multiplied by 3).
- Divide the accessory rpm by 60 (the number of seconds in a minute). In this example, the engine accessory frequency is 120 Hz (7,200 divided by 60).

### Calculating Engine Firing Frequency

Engine firing frequency is a term used to describe the pulses an engine creates from the firing of the cylinders. Engine firing frequency depends on how many cylinders an engine has. The number of times an engine fires a cylinder with each crankshaft revolution is equal to one-half the number of cylinders. A 4-cylinder engine fires 2 cylinders with each crankshaft revolution. Two revolutions of the crankshaft fire all 4 cylinders. A 6-cylinder engine fires 3 cylinders with each crankshaft revolution. An 8-cylinder engine fires 4 cylinders for each crankshaft revolution.

Calculate engine firing frequency by carrying out the following steps:

- Multiply the engine rpm where the vibration symptom occurs by the number of cylinders fired with each crankshaft revolution. For example, a vehicle with a 6-cylinder engine experiences a vibration concern at 2,400 rpm. The engine is firing the cylinders at 7,200 times per minute (3 multiplied by 2,400).
- Divide this number by 60 (the number of seconds in a minute) to obtain the engine firing frequency. In this example, the engine firing frequency is 120 Hz (7,200 divided by 60) at 2,400 rpm.

## Frequency and RPM Calculations Worksheet

FREQUENCY AND RPM CALCULATIONS	
<b>TIRE AND WHEEL</b>	
Vibration occurs at _____ mph (km/h)	
Tire diameter _____	
Tire speed RPM and frequency from chart _____ RPM _____ Hz	
<b>DRIVESHAFT</b>	
Tire/wheel frequency _____ x axle ratio = _____ Hz	
Tire/wheel RPM _____ x axle ratio = _____ RPM	
<b>ENGINE FREQUENCIES AND ASSOCIATED RPMS</b>	
Engine RPM divided by 60 equals 1st order frequency _____ Hz	
1st order RPM x 2 = 2nd order RPM (normal for 4 cylinder engines)	
Cylinders fired per engine revolutions _____ RPM	
1st order Hz x 2 = 2nd order Hz (normal for 4 cylinder engines) _____ Hz	
1st order RPM x 3 = 3rd order RPM (normal for 6 cylinder engines)	
1st order Hz x 3 = 3rd order Hz (normal for 6 cylinder engines)	
x 4 = 4th order vibrations (normal for 8 cylinder engines)	
x 5 = 5th order, x 6 = 6th order, etc.	
Order of vibration x engine RPM equals cylinders fired per minute _____ RPM	
Order of vibration (2nd, 3rd, 4th etc.) x 1st order Hz equals _____ Hz	
<b>ENGINE ACCESSORY FREQUENCIES AND RPMS</b>	
Crankshaft pulley diameter _____ divided by accessory pulley diameter _____ = _____ pulley size ratio	
Engine speed _____ RPM x pulley ratio = accessory _____ RPM	
Accessory pulley _____ RPM divided by 60 = _____ Hz	

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## Harshness Symptoms

Harshness is customer perception, which gives the impression of no isolation from the tire/wheel and suspension system. Harshness may be caused by road conditions, temperature changes, component damage and/or incorrect customer modifications on original components/specifications. Customers usually experience harshness when the vehicle is driving over bumps or potholes and in cold weather conditions. Harshness can also be experienced with excessive tire pressure, sporty tires, heavy-duty springs and shocks or other vehicle modifications. Some aftermarket tires, even with the correct size, may change vehicle behavior and produce

customer concerns. The first step in diagnosing a harshness concern is to determine if the concern was experienced only in certain specific operating conditions, such as large potholes or extremely cold weather. In these cases, harshness should be considered normal. A known good vehicle can be driven under the same conditions and the rides can be compared to determine whether the concern is normal or vehicle specific. The second step is to check tire pressure and make sure it was set within vehicle specifications. The third step is to inspect for aftermarket or modified components and determine if they are the cause of the harshness complaint. If the harshness concern persists after the above steps, it is possible that some components are damaged. Based on the results from the road test, make a determination of which action in the Symptom Chart to take first.

### NVH Symptom Chart Categories

A good diagnostic process is a logical sequence of steps that lead to the identification of a causal system. Use the symptom and possible system categories as follows:

- Identify the operating condition that the vehicle is exhibiting
- Match the operating condition to the symptom
- Verify the symptom
- Calculate the frequency and order of the symptom
- Identify which category or system(s) could cause the symptom
- Refer to the section indicated to identify and diagnose the symptom or confirm that the system is not the source of the condition

Use the diagnostic instructions in this section along with the necessary listed tools to identify the vibration order and to isolate the symptom and the possible systems associated with that symptom. Then based on the results from the road test, make a determination of which action in the Symptom Chart to take first. Since it is possible any one of multiple systems may be the cause of the symptom, it may be necessary to use a process of elimination type diagnostic approach to pinpoint the concern. Refer to the section(s) indicated to identify and isolate the cause or rule that system out as being the causal system for the symptom.

### Symptom Chart - Vehicle-Speed Related Vibrations

**NOTE:** Any assembly that is out of balance will only cause a first order vibration, it will not cause a higher order vibration.

When a vehicle-speed related vibration is present, both tire-speed related vibration and driveshaft-speed related vibration calculations should be carried out.

#### Symptom Chart - Tire-Speed Related Vibrations

Symptom Chart - Tire-Speed Related Vibrations

#### Symptom Chart - Driveshaft-Speed Related Vibrations

Symptom Chart - Driveshaft-Speed Related Vibrations

**NOTE:** Any assembly that is out of balance will only cause a first order vibration, it will not cause a higher order vibration.

#### Condition Possible Sources Action

- First order driveshaft vibration



- Driveshaft
- REFER to Section 205-00 .
- Pinion gear
- REFER to Section 205-00 .
- Pinion bearing
- REFER to Section 205-00 .
- Second order driveshaft vibration
- U-joint
- REFER to Section 205-00 .
- Output shaft bushing in transmission
- Refer to the appropriate section in Group 307 for the procedure. GO to Symptom Chart in the appropriate section.
- Third order driveshaft vibration
- Axle shaft
- REFER to Section 205-00 .
- Ring gear
- REFER to Section 205-00 .

### Symptom Chart - Engine-Speed Related Vibrations

#### Symptom Chart - Engine-Speed Related Vibrations

**NOTE:** When an engine-speed related vibration is present, engine, engine accessory and engine firing calculations should be carried out.

**NOTE:** Any assembly that is out of balance will only cause a first order vibration, it will not cause a higher order vibration.

**NOTE:** Some engine-speed related vibrations are normal though they should not be felt in the passenger compartment.

#### ConditionPossible SourcesAction

- 0.5 order engine vibration
- Engine
- REFER to Section 303-00 .

- First through sixth order engine vibration
- Engine
- REFER to Section 303-00 .
- Transmission
- Refer to the appropriate section in Group 307 for the procedure. GO to Symptom Chart in the appropriate section.
- Engine mounts
- REFER to Section 303-00 .
- Transmission mounts
- Refer to the appropriate section in Group 307 for the procedure. GO to Symptom Chart in the appropriate section.
- Exhaust system
- REFER to Section 309-00 .
- Belt driven accessory speed vibration
- Engine pulley
- REFER to Section 303-00 .
- Coolant pump
- REFER to Section 303-00 .
- Generator
- REFER to Section 414-00 .
- A/C compressor
- REFER to Section 412-00 .
- Power steering pump
- REFER to Section 211-00 .
- Vacuum pump
- REFER to Section 303-00 .
- Accessory drive belt
- REFER to Section 303-00 .

**Symptom Chart - Noise, Air Leaks or Water Leaks**

Symptom Chart - Noise, Air Leaks or Water Leaks

**Symptom Chart - Harshness**

Symptom Chart - Harshness

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## SECTION 501-00: Body System - General Information

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## SPECIFICATIONS

Procedure revision date: 08/19/2009

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## Material

Item	Specification	Fill Capacity
3MTM Strip Caulk - Black 051135-08578	WSB-M4G32-C	-
Seam Sealer TA-2	-	-
Clear Silicone Rubber TA-32	ESB-M4G92-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Silicone Spray Lubricant XL-6	ESR-M13P4-A	-
Trim and Weatherstrip Adhesive TA-14-A	-	-

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**Insulation**

Insulation is used as a sound-deadener to reduce exterior road and powertrain noises from the interior of the vehicle. Mastic insulators are also used as insulation. For information on the location of the mastic insulators, refer to Section 501-35 . Insulation is installed:

- under the roof panel.
  - above and below the instrument panel.
  - on the cowl sides.
  - over the front and rear floor areas.
  - in the B-pillar and C-pillar sections.
-

## **Body Sealer Types And Applications**

### **Seam Sealer**

Seam Sealer TA-2 or equivalent:

- is a heavy-bodied, non-sag adhesive/sealer for use on standing cosmetic seams, truck bed seams, tooled door skin seams and floor pans.
- can be used on water leaks and noise concerns.

### **Clear Silicone Rubber**

Clear Silicone Rubber TA-32 or equivalent meeting Ford Specification ESB-M4G92-A:

- does not run.
- is fast drying.
- remains semi-elastic.
- can be used for sealing water leaks, noise concerns, remounting trim and repairing torn weatherstripping.

### **Silicone Gasket and Sealant**

Silicone Gasket and Sealant TA-30 or equivalent meeting Ford specification WSE-M4G323-A4:

- is a form-in-place gasket and multi-purpose adhesive/sealant.
- is a room temperature curing silicone rubber.

### **Caulking Cord**

3MTM Strip Caulk-Black 051135-08578 or equivalent meeting Ford specification WSB-M4G32-C:

- is a heavy-bodied, plastic base with a filler.
- is commonly known as perma-gum.
- is used on spot-weld holes and between surfaces not sealed with a gasket.

### **Weatherstrip Adhesive**

Trim and Weatherstrip Adhesive TA-14-A or equivalent:

- is a quick drying, strong adhesive designed to hold weatherstripping onto all body panels and surrounding metal.

### **Silicone Lubricant**

Silicone Spray Lubricant XL-6 or equivalent meeting Ford specification ESR-M13P4-A:

- is used to keep the door and the window weatherstrip pliable and soft.
- makes the door easier to close.
- retards weatherstrip squeaks.
- retards weatherstrip wear.

- helps retain door window alignment by reducing friction between the glass frame and the rubber weatherstrip.
  - should not be used prior to painting.
-

**Body System**

## Material

Item	Specification
Seam Sealer TA-2	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

**Inspection and Verification****Dust and Water Leaks**

Most dust and water leaks occur due to missing or mis-installed body sealer or components. The source of the leak is detected by:

- pressurizing the vehicle and testing with soapy water.
  - ◆ Locate and tape off the body vents.
  - ◆ Turn the blower motor on the high position.
  - ◆ Turn the air recirculation to the off mode.
  - ◆ Close the windows and doors.
  - ◆ Open the hood and spray soapy water along body seams and grommets. Make sure to test the areas around the A-pillar at the fender and the hood hinge area.
  - ◆ Check for bubbles.
- inspecting for a dust pattern or water path near and above the area in question.
- removing any trim or carpet in the general area of the leak.
- road testing or water-hose testing the vehicle.
- placing a bright light under the vehicle, removing any necessary trim or carpet and inspecting the interior of the body at joints and weld lines.

**Wind Noise**

Most wind noise leaks occur at the corners of the windows or in the doors. Wind noise is detected by driving the vehicle at highway speeds or at speeds as specified by the customer. The vehicle should be driven in 4 different directions, with all the windows CLOSED, the radio OFF and the A/C blower motor OFF.

**Squeak and Rattle**

Squeak and rattle noises are generally caused by loose parts, contact or relative movement between 2 surfaces or loose wires and connectors. The source of the noise can be detected by stopping movement of the suspect part by hand or by using dampening or low friction materials.

**Symptom Chart - NVH**



Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible that any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

**Condition Possible Sources Action**

- Draft/wind noise and water leak around door perimeter
- Loose fit seal
- PINCH seal carrier to improve retention on seal flange.
- Seal installed incorrectly
- REINSTALL the seal.
- Door misaligned
- REALIGN the door. CHECK door gaps and fit in door opening and ADJUST as necessary. REFER to Section 501-03 .
- Scuff plate installed incorrectly
- REINSTALL the scuff plate.
- Seal or seal pushpins damaged
- INSTALL a new seal/pushpins.
- Sheet metal joints in door or door opening
- SEAL leaks with silicone gasket and sealant.
- Draft/wind noise and water leak around glass run
- Door glass misaligned
- ADJUST door glass.
- Glass run installed incorrectly
- REINSTALL glass run. INSERT foam in glass run carrier if necessary.
- Leak path behind glass run
- INSTALL foam rope behind glass run.
- Glass run channel spread wide
- PINCH glass run channel to reduce size of opening.

- Glass run damaged
- INSTALL a new glass run.
- Draft/wind noise and water leak at inner belt line
- Belt line seal installed incorrectly on flange
- ADJUST seal. (Do not bend the flange.)
- No contact with side glass
- ADJUST door glass.
- No contact with glass runs at both ends of belt line seal
- ADJUST belt line seal or ADD foam at seal ends.
- Belt line seal damaged
- INSTALL a new seal.
- Draft/wind noise and water leak at outer belt line
- Belt line seal installed incorrectly on flange (no glass contact)
- ADJUST seal.
- Belt line seal does not contact the glass
- ADJUST door glass.
- No contact with glass runs at both ends of belt line seal
- ADJUST belt line seal or ADD foam at seal ends.
- Belt line seal damaged
- INSTALL a new seal.
- Draft/wind noise at inner door handle/speaker opening
- Hole in weathershield
- SEAL hole with suitable tape.
- Weathershield misaligned
- REALIGN weathershield. INSTALL a new weathershield if pressure sensitive adhesive fails.
- Exterior door handle seal misaligned/damaged
- REALIGN or INSTALL a new seal as necessary. REFER to Section 501-14 .

- Speaker or speaker seal missing or damaged
- REPAIR speaker seal or INSTALL a new door speaker.
- Draft/wind noise and water leaks at floor pan and grommets
- Missing or damaged plugs/grommets
- CHECK plugs/grommets for correct installation or damage. INSTALL new plugs/grommets if necessary.
- Road noise
- Missing mastic insulators
- CHECK for missing mastic insulators. REFER to Section 501-35 .
- Missing body insulators
- CHECK for missing body insulators.
- Rattles in body/doors and instrument panel
- Loose wires/cables
- CHECK that all wires/cables are correctly routed and inserted in correct retainers.
- Loose objects/components in door wells, pillars or quarter trim panels
- CHECK doors by carefully striking underside of doors with a rubber mallet while listening for rattles in doors and pillars. REMOVE or TIGHTEN loose objects/components.
- Buzz from instrument panel components
- IDENTIFY which components of the instrument panel are buzzing. SECURE/FASTEN components as necessary, ADD foam or felt as needed if rattle persists.
- Door drain holes collecting water
- Holes clogged with mud or road tar
- CLEAN drain holes of foreign material with a punch or screwdriver. CHECK drain holes regularly.
- Wind noise from exterior rear view mirror
- Exterior mirror housing misaligned
- REALIGN with edges shingled to airflow, with no gaps.
- Mirror sail gasket folded/misaligned
- REINSTALL with gasket unfolded and aligned correctly.
- Mirror housing trim cap installed incorrectly

- REINSTALL with edges shingled to airflow.
- Air leak through mirror housing hinge
- Fully ENGAGE mirror into its operating position. USE foam to block air path through hinge.
- Inner sail trim installed incorrectly
- REINSTALL sail trim. ADJUST door trim.
- Inner sail gasket/barrier installed incorrectly
- REINSTALL trim cover with gasket/barrier aligned correctly
- Air path through wiring bundle/fastener access holes
- BLOCK air path(s) with foam/tape.
- Exposed fastener access hole on mirror housing/sail
- INSTALL a new cap if missing.
- Rattle/vibration from exterior rear view mirror
- Mirror glass adjustment screws loose
- REMOVE mirror glass and TIGHTEN mirror glass adjustment motor screws. REFER to Section 501-09 .
- Mirror mounting nuts loose
- TIGHTEN mirror mounting nuts. REFER to Section 501-09 .
- Aftermarket air deflector/stone shields
- If possible, REMOVE aftermarket air deflector/stone shield, then ROAD TEST vehicle. If concern is no longer present, ADVISE customer that aftermarket component was causing concern.
- Draft/wind noise and water leak around perimeter of all fixed glass
- Gaps in the sealant bead
- APPLY approved sealant.
- Air traveling up windshield molding along A-pillar
- INSTALL foam rope full length of the A-pillar.
- Gaps in sealant bead of windshield/rear glass
- RESEAL windshield/rear glass. REFER to Section 501-11 .
- Windshield/rear glass misaligned or not installed correctly

- REINSTALL windshield/rear glass. REFER to Section 501-11 .
- Rear hood seal at base of windshield misaligned/damaged
- REALIGN or INSTALL a new seal as necessary.
- Air leak at cowl
- Cowl seal misaligned/damaged
- REALIGN or INSTALL a new seal as necessary.
- Wind noise created by airflow over or behind body panels
- Fender splash shield misaligned
- REALIGN fender splash shield.
- Body panel misaligned (exposed edge)
- REALIGN appropriate body panel.
- Hood misaligned (front margin)
- CHECK hood gaps and fit. ADJUST hood as necessary.
- Front grille edge noise
- APPLY foam in hollow areas behind louvers.
- Wind noise created by grille opening panel
- Grille relationship to leading edge on hood
- If possible, ADJUST grille opening panel forward to eliminate wind noise.
- Sharp edges due to material imperfections
- REMOVE sharp edges (no damage to visible surface).
- Wind noise from air extractor
- Air extractor housing seated incorrectly
- REINSTALL air extractor housing.
- Air extractor housing or flaps damaged
- INSTALL a new air extractor.
- Wind noise from bug shield/exterior windshield sun visor
- Turbulence created by location and shape

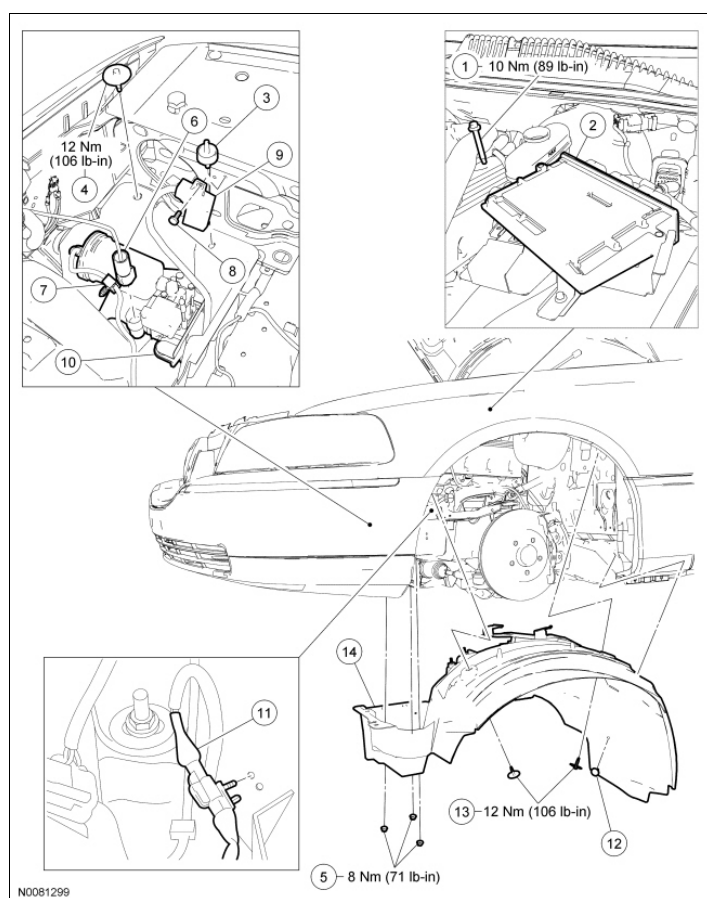
- DETERMINE if an OEM part or aftermarket. If aftermarket, ADVISE customer accordingly. If OEM, VERIFY correctly installed. If noise is abnormal, REPAIR or INSTALL new as required.
-

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Air compressor bracket nuts	8	-	71
Battery tray bolt	12	-	106
Fender front bolts	12	-	106
Fender inner rear bolt	28	21	-
Fender radiator grille opening panel front bolt	12	-	106
Fender splash shield bolt	12	-	106
Fender-to-radiator support bolt	12	-	106
Ground wire bolts	5	-	44
Hood hinge-to-hood bolts	12	-	106
Hood hinge-to-body bolts	12	-	106
Hood striker bolts	12	-	106
Lower front fender bolts	12	-	106
PCM bolt	10	-	89
Radiator grille opening panel bolt	12	-	106
Rear fender bolt	28	21	-
Rear fender brace bolt	28	21	-
Rocker panel fender bolts	28	21	-
Splash shield bolts	12	-	106
Upper rear fender bolts	43	32	-





**Fender Splash Shield - LH**

Item	Part Number	Description
1	-	PCM bolt
2	-	PCM
3	9P686	Air cleaner housing insulator
4	N800576	Upper fender splash shield bolt (part of 16044/45)
5	-	Air compressor bracket nuts (part of 5319 ) (3 required)
6	-	Air compressor electrical connector (part of 14290)
7	-	Air pressure hose locator (part of 5A897)
8	-	Air intake pin-type retainer (part of 5319)
9	-	Air intake (part of 5319)
10	5319	Air compressor
11	-	ABS sensor electrical connector (part of 14290)
12	-	Splash shield pin-type retainer (part of 16044/45)
13	-	Inner splash shield bolts (part of 16044/45) (2 required)
14	16044/45	Fender splash shield

**Removal and Installation**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A.
2. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.**

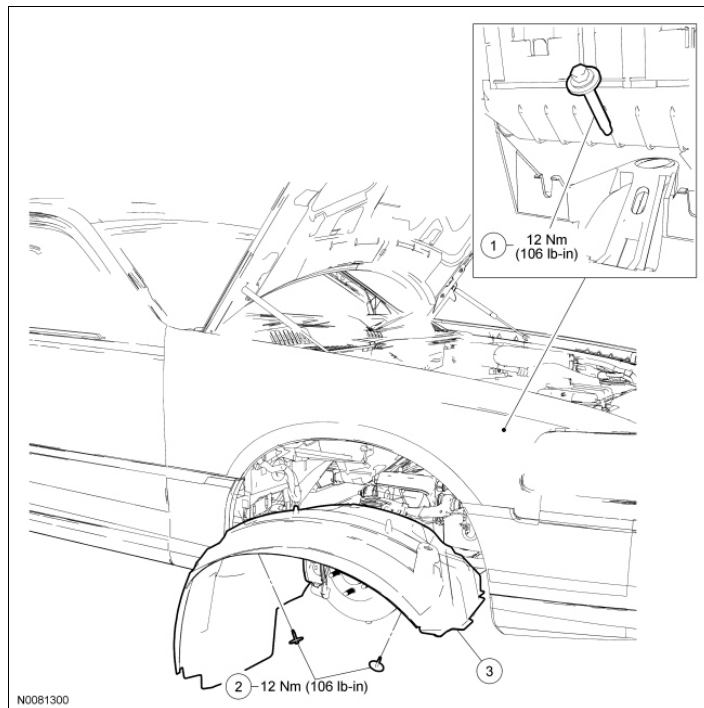
Disconnect the battery. For additional information, refer to Section 414-01.

3. Remove the air cleaner. For additional information, refer to Section 303-12.
4. Remove the bolt and position the PCM aside.
  - To install, tighten to 10 Nm (89 lb-in).
5. Release the wiring harness locator from the fender splash shield.
6. Release the front ABS sensor wiring harness locator.
7. Remove the air cleaner housing insulator.
8. Remove the upper fender splash shield bolt.
  - To install, tighten to 12 Nm (106 lb-in).
9. If equipped, remove the air compressor bracket nuts.
  - To install, tighten to 8 Nm (71 lb-in).
10. If equipped, disconnect the air compressor electrical connector.
11. If equipped, release the air pressure hose locator.
12. If equipped, disconnect the pin-type retainer and position the air compressor air intake aside.
13. Remove the 2 inner bolts, the pin-type retainer and the fender splash shield.
  - To install, tighten to 12 Nm (106 lb-in).
14. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B. Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure.

---



**Fender Splash Shield - RH**

Item	Part Number	Description
1	-	Battery tray bolt (part of 10732)
2	N800576	Splash shield bolts (part of 16044/45) (2 required)
3	16044/45	Splash shield

**Removal and Installation**

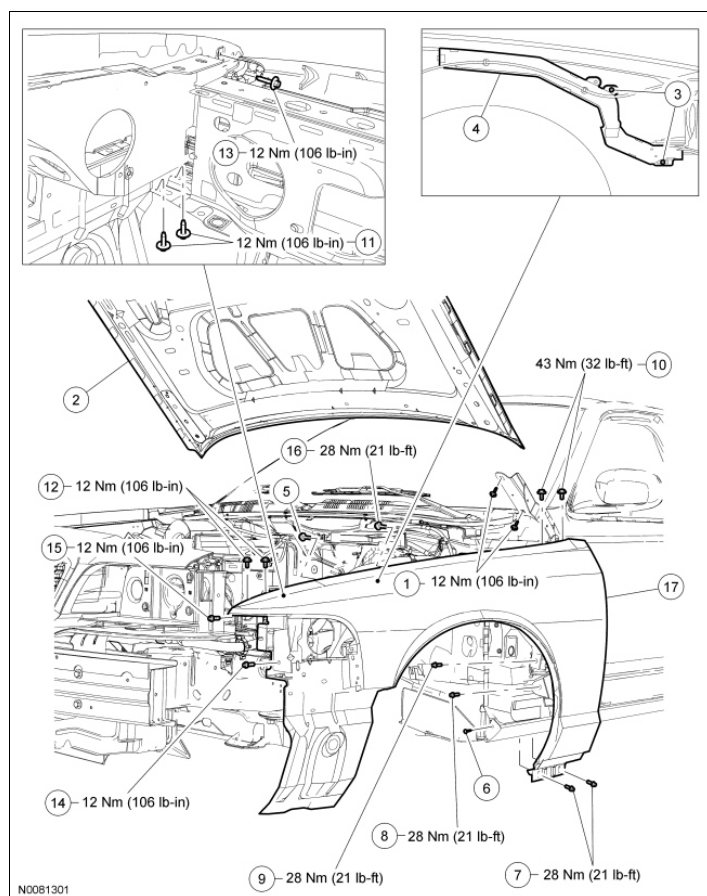
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Remove the battery. For additional information, refer to [Section 414-01](#).

3. Remove the battery tray bolt.
  - To install, tighten to 12 Nm (106 lb-in).
4. Remove the 2 bolts and the fender splash shield.
  - To install, tighten to 12 Nm (106 lb-in).
5. **⚠ WARNING:** If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

To install, reverse the removal procedure.



SECTION 501-02: Front End Body Panels  
REMOVAL AND INSTALLATION2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009**Fender**

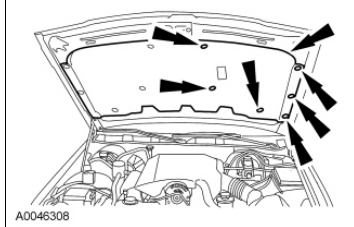
Item	Part Number	Description
1	N606677	Hood hinge-to-hood bolts (4 required)
2	16612	Hood
3	W704873	Wiring trough screws (2 required)
4	-	Wiring trough (part of 14290)
5	-	Ground wire bolt (2 required)
6	N803946	Rocker panel pin-type retainer
7	N807316	Rocker panel fender bolts (2 required)
8	N807316	Rear fender bolt (2 required)
9	N807316	Rear fender brace bolt
10	N807316	Upper rear fender bolts (2 required)
11	N807316	Lower front fender bolts (2 required)
12	N807316	Fender-to-radiator support bolts (2 required)
13	N606678	Radiator grille opening panel bolt
14	N808623	Fender front bolt
15	N807316	Fender radiator grille opening panel front bolt
16	N602480	Fender rear inner bolt
17	16006 LH/ 16005 RH	Fender

## Removal

**NOTE:** LH fender shown, RH fender similar.

1. **NOTE:** The pin-type retainers are a one-time use item, and new pin-type retainers must be installed after removal.

If equipped with an engine compartment lamp, remove the pin-type retainers and position the hood insulation aside.



2. If equipped, release the wiring harness locators and disconnect the engine compartment lamp electrical connector.
3. **NOTE:** Two technicians are needed to carry out this step.

**NOTE:** Support the hood with a suitable hood support.

Remove the hood.

- Mark the hinge locations.
- Remove the 4 hood hinge-to-hood bolts.

4. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

Remove the front bumper cover. For additional information, refer to **Section 501-19**.

5. Remove the fender splash shield. For additional information, refer to **Fender Splash Shield - LH** or **Fender Splash Shield - RH** in this section.
6. **NOTE:** Slide the wiring trough forward to release the trough locator from the fender.  
  
Remove the 2 screws and position the wiring trough and the hood release cable aside.
7. Remove the 2 ground wire bolts as required.
8. Remove the pin-type retainer and loosen the rocker panel moulding.
9. Remove the 2 rocker panel fender bolt.
10. Remove the rear fender bolt.

11. Remove the rear fender brace bolt.
12. Remove the 2 upper rear fender bolts.
13. Remove the 2 lower front fender bolts.
14. Remove the 2 fender-to-radiator support bolts.
15. Remove the radiator grille opening panel bolt.
16. Remove the fender front bolt.
17. Remove the fender radiator grille opening panel front bolt.
18. **NOTE:** On the RH fender, an assistant is needed to support the fender when removing this bolt.

Remove the fender inner rear bolt and the fender.

### Installation

1. Position the fender.
  2. Install the fender rear inner bolt.
    - Tighten to 28 Nm (21 lb-ft).
  3. Install the 2 upper rear fender bolts.
    - Tighten to 43 Nm (32 lb-ft).
  4. Install the rear fender bolts.
    - Tighten to 28 Nm (21 lb-ft).
  5. Install the rear fender brace bolt.
    - Tighten to 28 Nm (21 lb-ft).
  6. Install the 2 rocker panel fender bolts.
    - Tighten to 28 Nm (21 lb-ft).
  7. Position the rocker panel moulding and install the pin-type retainer.
  8. **NOTICE: The vehicle must be at the ride height when the front of the fender is attached. Failure to lower the vehicle will cause a misalignment between the radiator support and the fender.**
- Install the 2 fender-to-radiator support bolts.
- Tighten to 12 Nm (106 lb-in).
9. Install the 2 lower front fender bolts.
    - Tighten to 12 Nm (106 lb-in).
  10. Install the front fender bolt.
    - Tighten to 12 Nm (106 lb-in).
  11. Install the radiator grille opening panel front bolt.



- Tighten to 12 Nm (106 lb-in).
12. Install the radiator grille opening panel bolt.
    - Tighten to 12 Nm (106 lb-in).
  13. **NOTE:** The wire harness trough is only located on the LH fender.

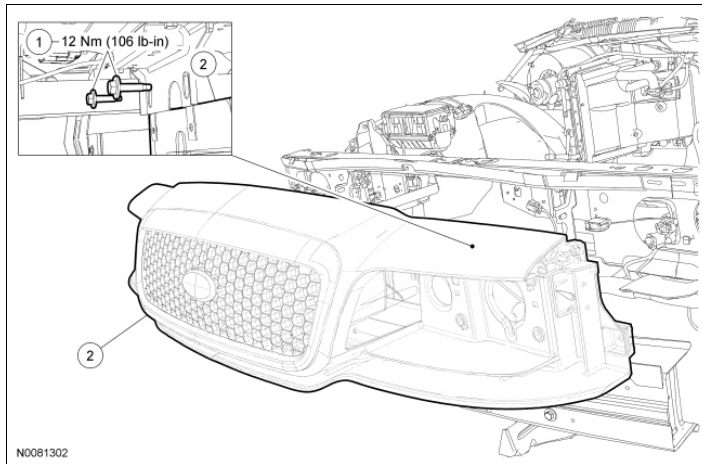
Position the wiring harness trough and hood latch release cable and install the 2 screws.
  14. Install the 2 ground wire bolts.
    - Tighten to 5 Nm (44 lb-in).
  15. Install the fender splash shield. For additional information, refer to Fender Splash Shield - LH or Fender Splash Shield - RH in this section.
  16. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Install the front bumper cover. For additional information, refer to Section 501-19 .
  17. **NOTE:** Two technicians are needed to carry out this step.

Line up the hood with the marks on the hinges and install the 4 hood hinge-to-hood bolts.

    - Tighten to 12 Nm (106 lb-in).
    - Align the hood as necessary.
  18. If equipped, install the wiring harness locators and connect the engine compartment lamp electrical connector.
  19. If equipped with an engine compartment lamp, position the hood insulation and install the pin-type retainers.
-

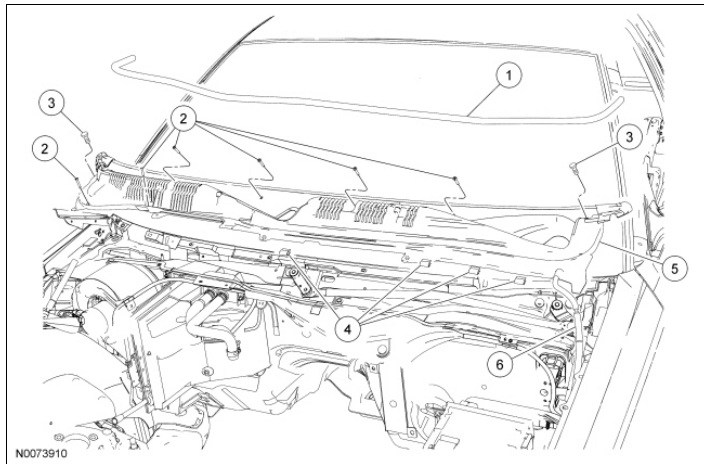


**Radiator Grille Opening Panel**

Item	Part Number	Description
1	N606677	Radiator grille opening panel bolts (4 required)
2	8190	Radiator grille opening panel

**Removal and Installation**

1. Remove the LH and RH front fenders. For additional information, refer to Fender in this section.
2. Remove the 4 bolts and the radiator grille opening panel.
  - To install, tighten to 12 Nm (106 lb-in).
3. To install, reverse the removal procedure.

**Cowl Panel Grille**

Item	Part Number	Description
1	-	Cowl panel grille weather seal (part of 02228)
2	N610021	Cowl panel grille screws (part of 02228) (6 required)
3	391349	Cowl panel grille pin-type retainers (part of 02228) (2 required)
4	N805886	Cowl panel grille retainer clips (5 required)
5	02222	Cowl panel grille
6	-	Washer hose union (part of 17K605)

**Removal and Installation**

1. Remove the wiper pivot arms. For additional information, refer to [Section 501-16](#).
2. Remove the 6 cowl panel grille screws.
3. Remove the 2 cowl panel grille pin-type retainers.
4. Remove the 4 cowl panel grille retainer clips.
5. Position the cowl panel grille aside and disconnect the washer hose union.
6. Remove the cowl panel grille.
7. To install, reverse the removal procedure.
  - If installing a new cowl panel grille, transfer components as necessary.



**Torque Specifications**

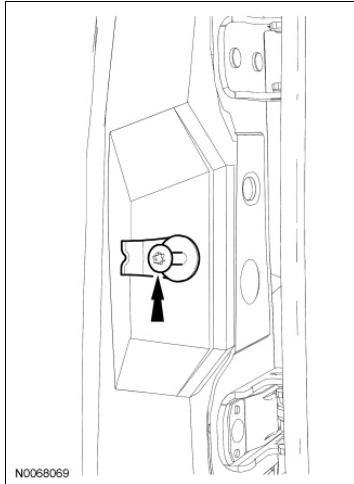
<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Door latch striker bolt	40	30	-
Front door hinge-to-body bolts/nuts	30	22	-
Front door hinge-to-door bolts	30	22	-
Lower door hinge nut	30	22	-
Luggage compartment lid bolts	6	-	53
Rear door hinge-to-body nuts	30	22	-
Rear door hinge-to-door bolts	30	22	-

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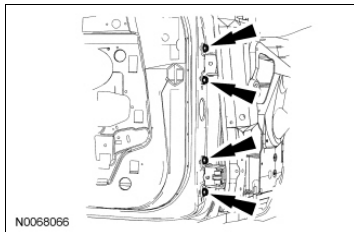
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**Door Alignment - Front****All alignments**

1. Loosen the door latch striker.

**In and out, up and down alignment**

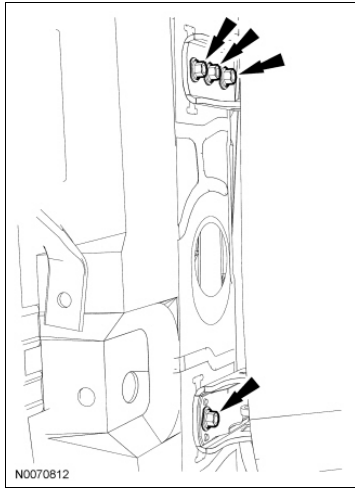
2. Loosen the door hinge-to-door bolts.



3. Align the door to specifications. For additional information on door clearances, refer to [Section 501-35](#).
4. Tighten the door hinge-to-door bolts to 30 Nm (22 lb-ft).

**Fore and aft alignment**

5. Remove the cowl side trim panel.
6. Loosen the lower door hinge-to-body nut.
7. Remove the front fender. For additional information, refer to [Section 501-02](#).
8. Loosen the 3 door hinge-to-body bolts and upper hinge-to-body nut.



9. Align the door to specifications. For additional information on door clearances, refer to [Section 501-35](#) .
10. Tighten the 3 door hinge-to-body bolts and the 2 hinge-to-body nuts to 30 Nm (22 lb-ft).
11. Install the front fender. For additional information, refer to [Section 501-02](#) .

#### **All alignments**

12. Adjust the door latch striker. For additional information, refer to [Striker Adjustment](#) in this section.
-



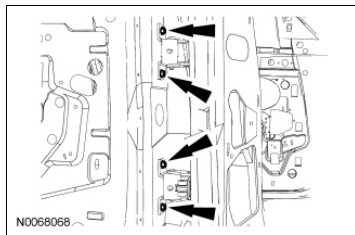
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**Door Alignment - Rear****All alignments**

1. Loosen the door latch striker.

**In and out, up and down alignment**

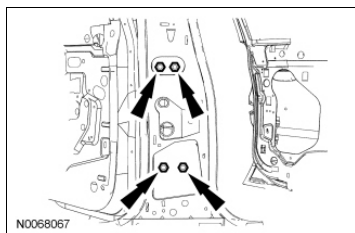
2. Loosen the 4 door hinge-to-door bolts.



3. Align the door to specifications. For additional information on door clearances, refer to [Section 501-35](#).
4. Tighten the 4 door hinge-to-door bolts to 30 Nm (22 lb-ft).

**Fore and aft alignment**

5. Remove the front and rear door scuff plates and position aside the lower B-pillar trim panel.
6. Loosen the 4 door hinge-to-body nuts.



7. Align the door to specifications. For additional information on door clearances, refer to [Section 501-35](#).
8. Tighten the 4 door hinge-to-body nuts to 30 Nm (22 lb-ft).

**All alignments**

9. Adjust the door latch striker. For additional information, refer to [Striker Adjustment](#) in this section.
-

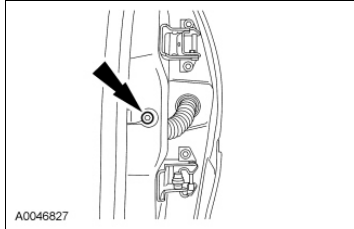


### **Luggage Compartment Lid Alignment**

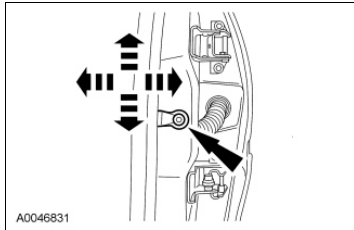
1. Loosen the 4 luggage compartment lid bolts.
  2. Align the luggage compartment lid to specifications. For additional information on luggage compartment lid clearances, refer to Section 501-35 .
  3. Tighten the 4 luggage compartment lid hinge bolts to 6 Nm (53 lb-in).
-

## Striker Adjustment

1. Loosen the door latch striker.



2. Align the door latch striker to specifications. For additional information on door clearances, refer to [Section 501-35](#).



3. Tighten the door latch striker to 40 Nm (30 lb-ft).
-

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**Torsion Bar Loading**

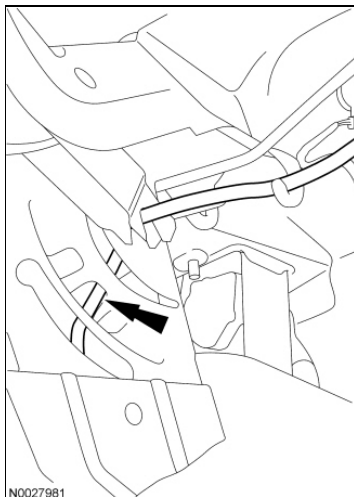
**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

1. **NOTE:** The luggage compartment lid tension should be decreased if the luggage compartment lid opens with more force than desired. The luggage compartment lid tension should be increased if the luggage compartment lid opens with less force than desired.

Open and support the luggage compartment lid in the full-open position.

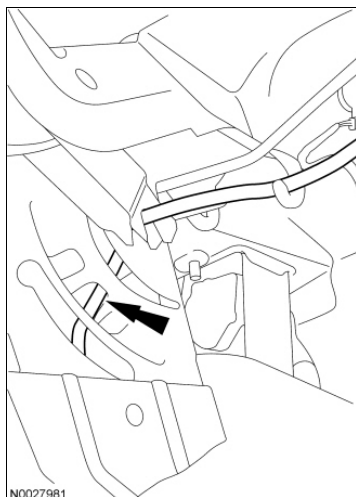
2. **⚠ WARNING:** Securely grasp the luggage compartment lid torsion bar while adjusting. The bar is under tension and could spring out unintentionally if it is not handled correctly. Failure to follow this instruction may result in serious personal injury.

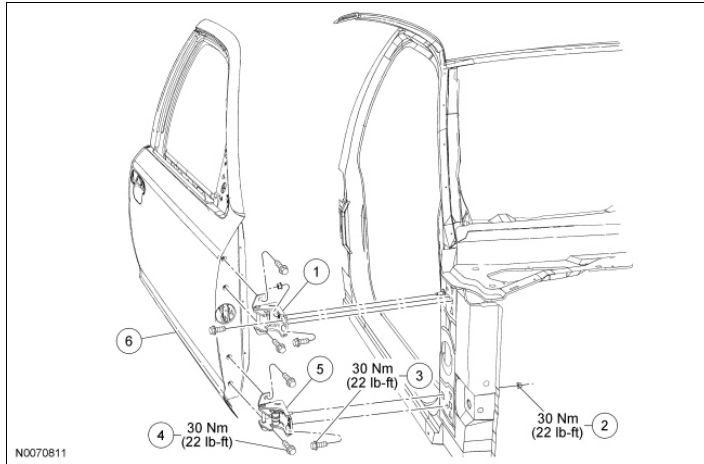
Move the luggage compartment lid end of the luggage compartment lid torsion bar to another position.



3. Check the adjustment.
4. **⚠ WARNING:** Securely grasp the luggage compartment lid torsion bar while adjusting. The bar is under tension and could spring out unintentionally if it is not handled correctly. Failure to follow this instruction may result in serious personal injury.

Move the luggage compartment door end of the luggage compartment lid torsion bar to another position.



**Door - Front****NOTE:** Front door shown.

Item	Part Number	Description
1	5422800	Upper door hinge
2	N621941-S2	Door hinge-to-body nut (1 required per hinge)
3	N806738-S2	Door hinge-to-body bolt (2 required for upper hinge, 1 required for lower hinge)
4	N806738-S2	Door hinge-to-door bolt (2 required per hinge)
5	5422806	Lower door hinge
6	-	Door assembly

**Removal and Installation**

1. Disconnect the electrical connector at the door.

2. **NOTICE:** To avoid damaging the door, this step requires an assistant.

With a wax pencil, mark the position of each hinge and remove the door hinge-to-door bolts.

- To install, tighten to 30 Nm (22 lb-ft).

3. Remove the door.

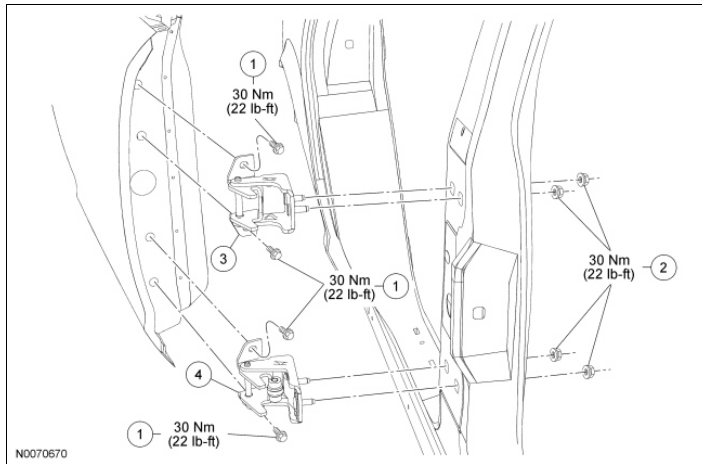
4. **NOTICE:** To minimize the possibility of cross threading, hand start all fasteners during the installation.

To install, reverse the removal procedure.

- Check for correct door alignment. For additional information, refer to Door Alignment - Front in this section.





**Door - Rear**

Item	Part Number	Description
1	N806738-S2	Rear door hinge-to-door bolts
2	N621941-S2	Rear door hinge-to-body nuts
3	5426800	Rear door upper hinge
4	5426806	Rear door lower hinge

**Removal and Installation**

1. Disconnect the electrical connector at the door.
2. **NOTICE:** To avoid damaging the door, this step requires an assistant.

With a wax pencil, mark the position of each hinge and remove the door hinge-to-door bolts.

- To install, tighten to 30 Nm (22 lb-ft).

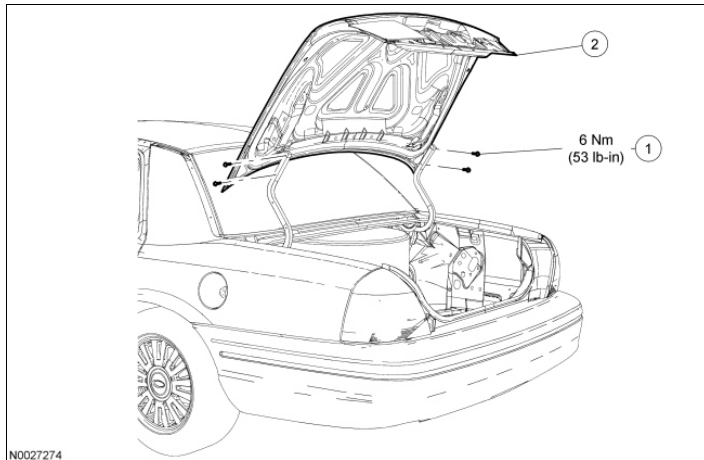
3. Remove the door.

4. **NOTICE:** To minimize the possibility of cross threading, hand start all fasteners during installation.

To install, reverse the removal procedure.

- Check for correct door alignment. For additional information, refer to Door Alignment - Rear in this section.



**Luggage Compartment Lid**

Item	Part Number	Description
1	-	Luggage compartment lid bolts (4 required)
2	5440170	Luggage compartment lid

**Removal**

1. If equipped, remove the luggage compartment lid trim panel.
2. Disconnect the 3 electrical connectors.
3. Release the luggage compartment lid wiring harness retainers and remove the wiring harness.
4. Remove the 4 bolts and the luggage compartment lid.
  - To install, tighten to 6 Nm (53 lb-in).
5. To install, reverse the removal procedure.



**General Specifications**

Item	Specification
Headliner Adhesive (commercially available)	WSS-M2G355-B

**Torque Specifications**

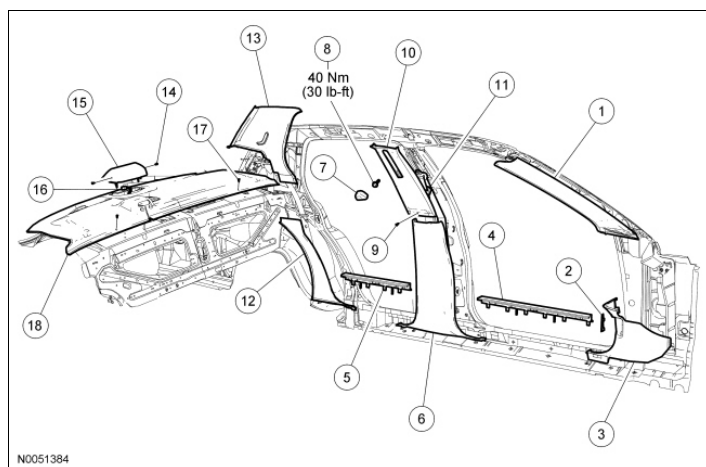
Description	Nm	lb-ft
Safety belt D-ring bolt	40	30

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SECTION 501-05: Interior Trim and  
Ornamentation  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

### Interior Trim - Exploded View



Item	Part Number	Description
1	03598	Upper A-pillar trim panel
2	16B999	Hood release bezel
3	02344	Lower A-pillar trim panel
4	13208	Front door scuff plate
5	13228	Rear door scuff plate
6	24346	Lower B-pillar trim panel
7	60262	Safety belt D-ring cover
8	N807537	D-ring bolt
9	N804992	Upper B-pillar trim panel screw
10	24346	Upper B-pillar trim panel
11	611B08	Safety belt
12	31012	Lower quarter trim panel
13	52018	Rear quarter trim panel
14	N610127	High mounted stoplamp screw (2 required)
15	13A613	High mounted stoplamp
16	14A005	High mounted stoplamp electrical connector
17	390018	Pin-type retainer (2 required)
18	46668	Parcel shelf

1. For additional information, refer to the procedures in this section.



## **B-Pillar Trim Panel**

### **Removal and Installation**

1. Remove the front and rear door scuff plates.
  2. Position the front and rear door weatherstrips aside.
  3. Remove the lower B-pillar trim panel.
  4. Remove the safety belt D-ring cover.
  5. Remove the safety belt D-ring bolt.
    - To install, tighten to 40 Nm (30 lb-ft).
  6. Remove the screw and the upper B-pillar trim panel.
  7. To install, reverse the removal procedure.
    - Check the restraint system for correct operation.
-



## **Quarter Trim Panel**

### **Removal and Installation**

1. Remove the rear seat. For additional information, refer to Section 501-10 .
  2. Position the rear door weatherstrip aside.
  3. Remove the upper rear quarter trim panel.
    - Slide the safety belt through the rear quarter trim panel opening.
  4. Remove the lower rear quarter trim panel.
  5. To install, reverse the removal procedure.
    - Check the restraint system for correct operation.
-

## **Parcel Shelf**

### **Removal and Installation**

#### **Vehicles with Police option**

1. If equipped, remove the flashing rear deck lights. For additional information, refer to Section 417-01 .

#### **All vehicles**

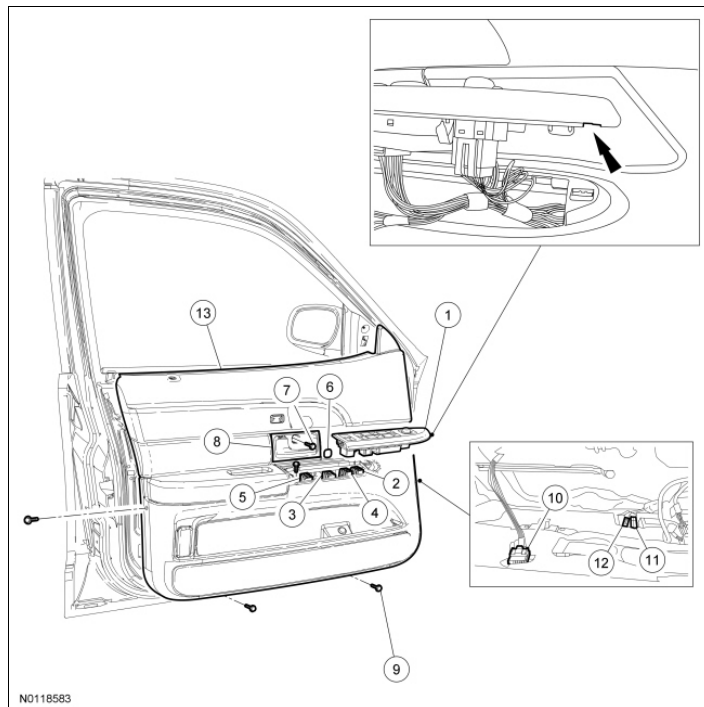
2. Remove the rear quarter trim panels. For additional information, refer to Quarter Trim Panel in this section.

#### **Vehicles without Police option**

3. Remove the 2 high-mounted stoplamp screws.
4. Disconnect and remove the high-mounted stoplamp.
5. Release and remove the high-mounted stoplamp brackets.

#### **All vehicles**

6. Remove the 2 pin-type retainers and the parcel shelf.
  7. To install, reverse the removal procedure.
    - Check the restraint system for correct operation.
-

**Door Trim Panel - Front**

Item	Part Number	Description
1	14528	Window control switch plate
2	-	Mirror control switch electrical connector (part of 14A005)
3	-	Door lock switch electrical connector (part of 14A005)
4	-	Master window control switch electrical connector (part of 14A005)
5	-	Master window lock-out switch electrical connector (part of 14A005)
6	23862	Door handle cup screw cover
7	W705133	Door handle cup screw
8	22634	Door handle cup
9	W705133	Front door trim panel screw (4 required)
10	-	Heated seat switch (if equipped) (part of 14C719)
11	-	Luggage compartment lid release switch electrical connector (part of 14A005)
12	-	Door entry lamp electrical connector (part of 14A005)
13	23942	Front door trim panel

**Removal and Installation**

**NOTE:** Driver door shown, passenger door similar.

1. Remove the exterior mirror cover.

**2. *NOTICE:* Use care not to damage the trim panel when removing the interior door handle.**

Remove the door handle cup screw cover, screw and door handle and cup.

**3. *NOTICE:* Use a shop towel or similar material between the tool and the front door trim panel or damage to the front door trim panel may occur.**

Remove the window control switch plate.

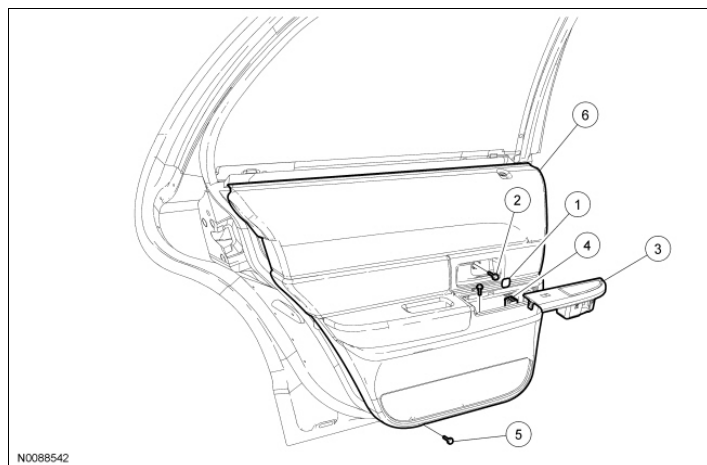
1. Locate the tooling notch in the window control switch plate.
2. Insert a towel covered flat-bladed screw driver in the notch.
3. Slightly twist the screw driver to release the plate from the door trim panel.
4. Disconnect the window regulator and door lock switch electrical connectors and remove the window control switch plate assembly.

4. Remove the 4 front door trim panel screws and position the front door trim panel aside.

5. Disconnect the 3 electrical connectors and remove the front door trim panel.

6. To install, reverse the removal procedure.

---

**Door Trim Panel - Rear**

Item	Part Number	Description
1	23862	Door handle cup screw cover
2	N804592	Door handle cup screw
3	14A570	Window regulator switch plate
4	-	Window regulator switch electrical connector (part of 14A005)
5	N804592	Rear door trim panel screw (if equipped) (2 required)
6	27406	Rear door trim panel

**Removal and Installation**

**NOTE:** Driver side door shown, passenger side door similar.

1. Remove the door handle cup screw cover and the screw.
2. If equipped, remove the 2 passenger assist handle covers, 2 screws and the passenger assist handle.
3. **NOTICE:** Use a shop towel or similar material between the tool and the rear door trim panel or damage to the rear door trim panel may occur.

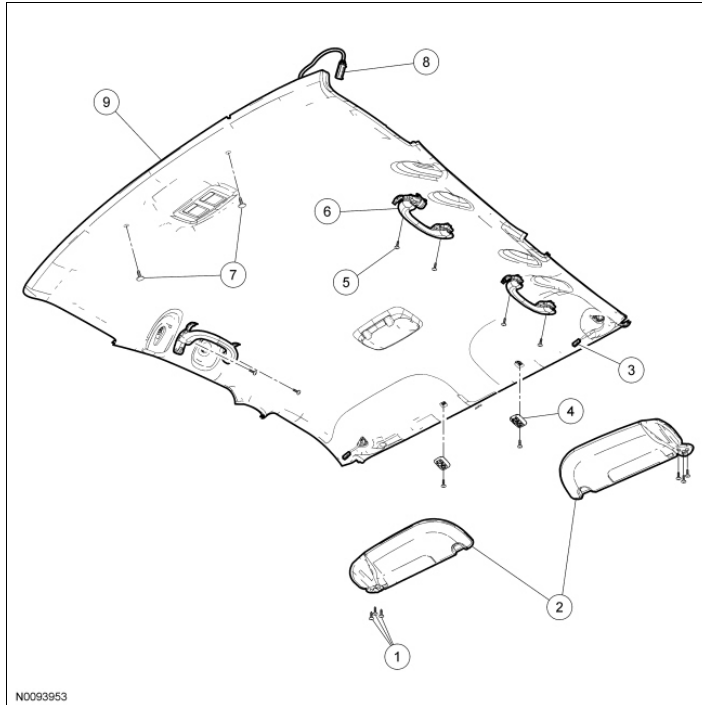
Release the window regulator switch plate, disconnect the electrical connector and remove the window regulator switch plate.

4. **NOTE:** Long Wheel Base (LWB) vehicles are equipped with 5 screws.

Remove the 2 screws and the rear door trim panel.

5. To install, reverse the removal procedure.



**Headliner**

Item	Part Number	Description
1	-	Sun visor screws (part of 04105) (8 required)
2	04105 / 04104	Sun visors (2 required)
3	-	Sun visor electrical connector (part of 14334) (2 required)
4	54041	Sun visor clip (2 required)
5	-	Passenger assist handle screw (part of 31406) (6 required)
6	31406	Passenger assist handle (3 required)
7	N802734	Headliner pin-type retainers (2 required)
8	-	Headliner electrical connector (part of 14A464)
9	51916	Headliner

**Removal****All vehicles**

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

1. Remove the front seats. For additional information, refer to **Section 501-10** .
2. If equipped, remove the floor console. For additional information, refer to **Section 501-12** .

3. **NOTICE:** The overhead console bracket is supported by the headliner. Failure to follow the removal procedure will damage the headliner.

**NOTE:** Support the headliner at the rear corner of the overhead console.

If equipped, remove the overhead console. Pull down on the rear corner of the overhead console and disconnect the electrical connectors.

4. If equipped, position the fire suppression manual switch aside.
5. Remove the LH and RH front door weatherstrips.
6. Remove the LH and RH upper A-pillar trim panels.
7. Remove the 8 screws, 2 sun visors and the 2 sun visor clips.
  - Disconnect the 2 electrical connectors.
8. Remove the B-pillar trim panel. For additional information, refer to B-Pillar Trim Panel in this section.
9. Remove the 6 screws and the 3 passenger assist handles.
10. Remove the rear quarter trim panel. For additional information, refer to Quarter Trim Panel in this section.
11. Remove the 2 pin-type retainers.

#### **Vehicles with roof opening panel**

12. **NOTICE:** Carefully pull the rear of the headliner down to gain access to the rear domelamp electrical connector.

Disconnect the rear domelamp electrical connector.

13. Remove the headliner retainer and pull down the sides of the headliner above the door openings.

#### **Vehicles without roof opening panel**

14. If equipped, disconnect the fire suppression manual switch electrical connector at the RH A-pillar.
15. Disconnect the headliner harness electrical connector at the RH C-pillar.
16. **NOTE:** Pull down the sides of headliner above the door openings to expose adhesive beads.

Using a hot knife or wide-blade putty knife, cut adhesive beads lengthwise across the headliner.

#### **All vehicles**

17. **NOTE:** A new headliner must be installed if the headliner is folded in half for removal.


Remove the headliner through the front door opening.

#### **Vehicles without roof opening panel**



18. Clean any remaining adhesive from the roof sheet metal.

### Installation

1.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

**NOTE:** A new headliner needs to be installed if it is folded during removal or installation.

To install, reverse the removal procedure.

- Vehicles with roof opening panel, do not apply adhesive to the headliner.
  - Vehicles without roof opening panels, acquire commercially available headliner adhesive and apply using the existing pattern.
-

## SECTION 501-08: Exterior Trim and Ornamentation

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## SPECIFICATIONS

Procedure revision date: 03/03/2010

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## Material

Item	Specification	Fill Capacity
Motorcraft® Detail Wash ZC-3-A	-	-

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**Body Side Moulding**

## Special Tool(s)

	Heat Gun 107-R0300
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## Material

Item	Specification
Motorcraft® Detail Wash ZC-3-A	-

**NOTICE:** Body side molding installation should not be attempted on vehicle with surface temperatures below 21° C (70° F) or adhesion problems could occur.

1. **NOTICE:** The vehicle body must be clean prior to installation of an adhesive backed body side molding.

Wash and dry the vehicle exterior.

2. **NOTE:** The use of a small amount of heat may aid in removal of adhesive backed moldings do not exceed 52° C (125° F).

If installed, carefully remove the adhesive-back body side molding.

3. **NOTICE:** Do not use sharp objects or metal-bladed putty knives for removal as damage to paint could occur.

Remove all remaining adhesive from the vehicle body.

4. Clean the area with a commercially available wax and grease remover.
  - Re-clean the area using a commercially available alcohol cleaner

5. **NOTICE:** Do not exceed 52° C (125° F) or damage to the molding could occur.

If the molding is curled or distorted it may be brought back to correct shape when warmed.

6. Warm the moldings evenly on a flat surface prior to installation using a heat gun.
  - Temperature range should not exceed 38° C (100° F) - 52° C (125° F)

7. Remove the adhesive tape liner from the body side molding.

8. Properly position the molding to the vehicle and apply firm pressure to the entire molding until fully adhered to the vehicle body.

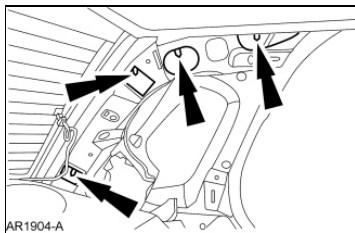


## Quarter Panel Moulding

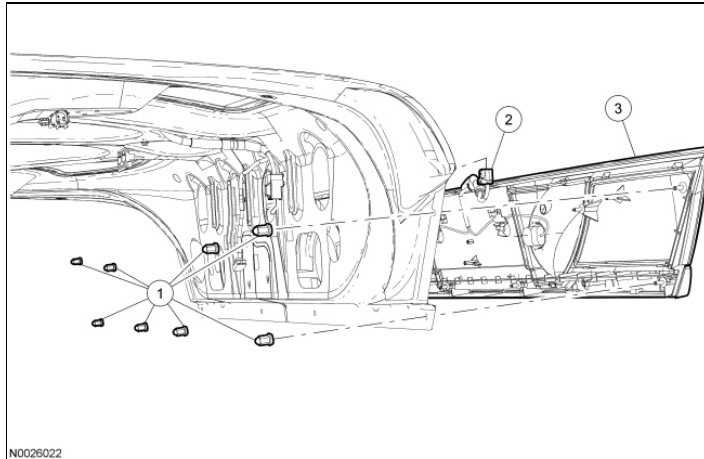
### Removal and Installation

**NOTE:** Before removing the exterior mouldings, determine the type of retainer used and whether the respective door trim panel, quarter trim panel or luggage compartment trim panel must first be removed to provide access.

1. Remove the rear quarter trim panel. For additional information, refer to [Section 501-05](#) .
2. Remove the roof side moulding.



3. To install, reverse the removal procedure.
-

**License Plate Housing**

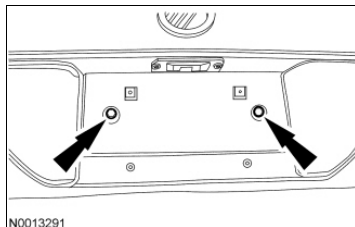
Item	Part Number	Description
1	W712159-S900	License plate housing nuts (8 required)
2	-	License plate lamp electrical connector (part of 13B433)
3	13B508	License plate housing (Grand Marquis)
3	13B433	License plate housing (Crown Victoria)

**Removal and Installation****All vehicles**

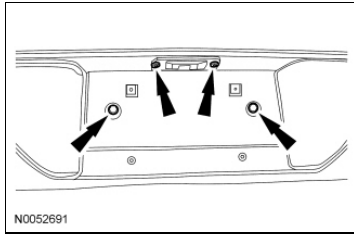
1. Remove the 8 license plate housing nuts.
2. Disconnect the license plate housing electrical connector.
3. Remove the 2 screws and the license plate.

**Grand Marquis**

4. Remove the 2 screws and the license plate housing.

**Crown Victoria**

5. Remove the 4 screws and the license plate housing.



**All vehicles**

6. To install, reverse the removal procedure.
-

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Exterior mirror motor screws	2	18
Exterior mirror nuts	7	62

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## Rear View Mirrors

The main components of the exterior rear view mirrors are:

- Exterior mirror control switch
- Exterior mirror cover
- Exterior mirror glass
- Exterior mirror glass adjustment motors
- Exterior mirror plastic housing

## Exterior Mirrors

### Power Exterior Mirrors

Power mirrors allow the driver or passenger mirror glass to be positioned electronically. The position of the power mirror glass is controlled by the exterior rear view mirror control switch. Adjusting the exterior rear view mirror control switch to the LH or RH position determines which power mirror glass will be controlled.

### Heated Exterior Mirrors

The power exterior rear view mirrors are available with a heated mirror glass feature, which heats the mirror glass to remove frost, snow, ice and condensation. The rear window defrost switch controls the operation of the heated exterior rear view mirrors. The heated exterior rear view mirrors only operate when the rear window defrost system is on.

## Interior Mirror

The vehicle may be equipped with one of the following interior rear view mirrors:

- Interior rear view mirror
- Interior auto-dimming rear view mirror
  - ◆ with compass

### Interior Rear View Mirror

The interior rear view mirror consists of a mirror glass and housing. The interior rear view mirror mounts to an interior rear view mirror bracket at the upper center of the windshield glass. The interior rear view mirror can be adjusted left, right, up and down using the 2 pivot points on the support arm. The interior rear view mirror can be adjusted from a day position to a night position to reduce unwanted glare caused by headlamps reflecting in the mirror. Adjusting the interior rear view mirror day/night tab, located at the bottom of the interior rear view mirror, rearward will adjust the interior mirror to the night position. Adjusting the interior rear view mirror day/night tab forward will adjust the interior mirror the day position.

### Interior Auto-Dimming Rear View Mirror


The interior auto-dimming rear view mirror feature automatically reduces the glare caused by headlamps reflecting in the interior rear view mirror. The interior auto-dimming rear view mirror adjusts the reflectance level of the interior rear view mirror glass to eliminate unwanted glare. The reflectance level of the mirror glass is variable and depends on the amount of rear glare in relation to ambient light conditions in front of the interior mirror. When the forward sensor detects daytime conditions, the rearward sensor is inactive and the

interior rear view mirror stays in a high reflectance mode. When the forward sensor detects nighttime conditions, the rearward sensor is active and detects glare from the headlights of vehicles approaching from the rear or other glare-producing light sources. To provide increased visibility when backing up, the interior rear view mirror will automatically return to a high reflectance mode whenever the vehicle is in REVERSE.

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**Rear View Mirrors - Exterior**

## Special Tool(s)

	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
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**Principles of Operation**

The movement of the LH and RH exterior mirror glass is controlled by the exterior mirror control switch and the LH and RH exterior mirror motors. Adjusting the exterior mirror switch to the LH or RH position determines which exterior mirror motor will be controlled. The exterior mirror control switch logic is the selected movement request from the exterior mirror control switch. When the exterior mirror control switch is adjusted to the left, right, up or down position, the exterior mirror control switch will supply voltage and ground to the selected exterior mirror motor to move the exterior mirror glass to the desired position.

The exterior mirrors use a jumper harness between the vehicle wire harness connector and the exterior mirror motor. The exterior mirror jumper harness is integral to the exterior mirror. Before replacing an exterior mirror or mirror motor, inspect the jumper harness for open and shorted circuits or damaged and pushed-out pins. If a concern with the exterior mirror jumper harness exists, attempt to repair the jumper harness.

**Heated Exterior Mirror**

The rear window defrost switch controls the operation of the heated exterior rear view mirrors. The heated exterior rear view mirrors only operate when the rear window defrost system is operating. The heated exterior rear view mirror power is supplied by the rear defrost relay through Battery Junction Box (BJB) fuse 24 (10A), which isolates the heated exterior mirrors from the rear window defrost system in the event of a concern.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Exterior mirror</li> <li>• Exterior mirror control switch</li> <li>• Exterior mirror glass</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 24 (10A)</li> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 2 (7.5A)</li> </ul> </li> </ul>

	<p>◆ 9 (7.5)</p> <ul style="list-style-type: none"> <li>• Exterior mirror control switch</li> <li>• Exterior mirror motor</li> <li>• Exterior mirror</li> <li>• Heated exterior mirror glass</li> <li>• Loose or corroded connections</li> <li>• Wiring harness</li> </ul>
--	--

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and GO to Symptom Chart - Exterior Mirrors or GO to Symptom Chart - NVH.

### Symptom Chart - Exterior Mirrors

Symptom Chart - Exterior Mirrors

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

#### ConditionPossible SourcesAction

- Exterior mirror vibrates/loose
- Exterior mirror mounting nuts loose
- TIGHTEN the exterior mirror fasteners to the specified value located in the Specifications table.
- Exterior mirror glass loose
- PRESS the center of the exterior mirror glass up, down, left and right to make sure that the exterior mirror glass is seated correctly. If the exterior mirror glass is still loose, REMOVE the exterior mirror glass and INSPECT the exterior mirror backing plate for damage. If the exterior mirror backing plate is damaged, INSTALL a new exterior mirror glass. REFER to Exterior Mirror Glass in this section.
- Aftermarket air deflector/stone shields
- If possible, REMOVE aftermarket air deflector/stone shield, then ROAD TEST the vehicle. If concern is no longer present, ADVISE customer that aftermarket components were causing undesired vibration.

- Wind noise
- Foam gasket between the exterior mirror and door frame is missing or damaged
- VERIFY that the foam gasket is present and in good condition. If necessary, REPOSITION the foam gasket between the exterior mirror and door frame.
- Exterior mirror is not correctly fitted to the door
- VERIFY that there are no gaps between the exterior mirror and the door. If necessary, LOOSEN the exterior mirror nuts and REPOSITION the exterior mirror.
- Exterior mirror cover
- VERIFY that the exterior mirror cover is not loose or broken. If necessary, INSTALL a new exterior mirror cover. REFER to Exterior Mirror Cover in this section.

## Pinpoint Tests

### Pinpoint Test A: The Mirrors are Inoperative

Refer to Wiring Diagrams Cell 124 , Power Mirrors for schematic and connector information.

#### Normal Operation

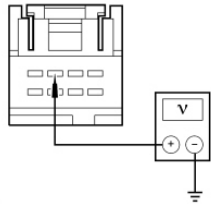
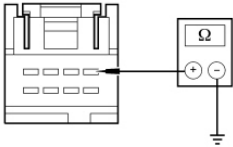
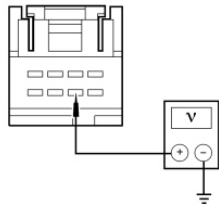
Under normal operation, the exterior mirror control switch receives voltage from Central Junction Box (CJB) fuse 2 (7.5A) through circuit 1523 (DG) and ground through circuit 57 (BK). The exterior mirror control switch uses circuit 945 (YE/BK) as the common circuit for both exterior mirror motor up/down and right/left movement.

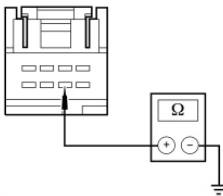
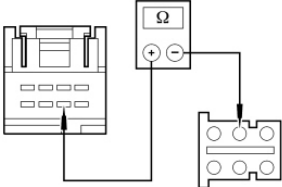
#### This pinpoint test is intended to diagnose the following:

- Fuse
- Exterior mirror control switch
- Wiring, terminals or connectors

#### PINPOINT TEST A: THE MIRRORS ARE INOPERATIVE

Test Step	Result / Action to Take
<b>A1 CHECK THE VOLTAGE TO THE EXTERIOR MIRROR CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Exterior Mirror Control Switch C527.</li> <li>• Measure the voltage between exterior mirror control switch C527-3, circuit 1523 (DG), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> VERIFY the CJB fuse 2 (7.5A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>

 <p>N0006111</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<b>A2 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between exterior mirror control switch C527-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0006112</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>A3 CHECK CIRCUIT 945 (YE/BK) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between exterior mirror control switch C527-6, circuit 945 (YE/BK), harness side and ground.</li> </ul>  <p>A0073142</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A4</u> .</p>
<b>A4 CHECK CIRCUIT 945 (YE/BK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between exterior mirror control switch C527-6, circuit 945 (YE/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

 <p>A0073143</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>A5 CHECK CIRCUIT 945 (YE/BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LH Exterior Mirror C516.</li> <li>• Measure the resistance between exterior mirror control switch C527-6, circuit 945 (YE/BK), harness side and LH exterior mirror C516-2, circuit 945 (YE/BK), harness side.</li> </ul>  <p>N0089080</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms&gt;</li> </ul>	<p><b>Yes</b> INSTALL a new exterior mirror control switch. REFER to <u>Exterior Mirror Control Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

### Pinpoint Test B: A Single Mirror is Inoperative

Refer to Wiring Diagrams Cell 124 , Power Mirrors for schematic and connector information.

#### Normal Operation

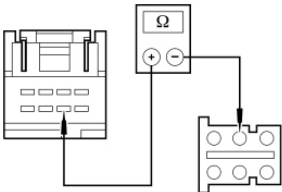
Under normal operation, the exterior mirror control switch uses circuit 945 (YE/BK) as the common circuit for both exterior mirror down/up and left/right movement.

**This pinpoint test is intended to diagnose the following:**

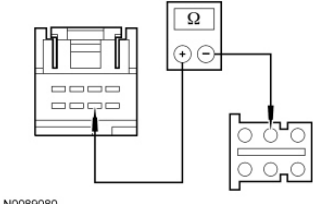
- Wiring, terminals or connectors
- Exterior mirror control switch
- Exterior mirror motor
- Exterior mirror

#### PINPOINT TEST B: A SINGLE MIRROR IS INOPERATIVE

Test Step	Result / Action to Take
<b>B1 CHECK THE LH MIRROR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the LH exterior mirror using the exterior mirror control</li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p>

switch. • <b>Does the LH exterior mirror operate?</b>	<b>No</b> GO to <b>B4</b> .
<b>B2 CHECK THE EXTERIOR MIRROR CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Exterior Mirror Control Switch C527.</li> <li>• Carry out the Exterior Mirror Control Switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <b>149</b> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Did the exterior mirror control switch pass the component test?</b></li> </ul>	<p><b>Yes</b> GO to <b>B3</b>.</p> <p><b>No</b> INSTALL a new exterior mirror control switch. REFER to <u>Exterior Mirror Control Switch</u> in this section. TEST the system for normal operation.</p>
<b>B3 CHECK CIRCUIT 945 (YE/BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: RH Exterior Mirror C622.</li> <li>• Measure the resistance between exterior mirror control switch C527-6, circuit 945 (YE/BK), harness side and RH exterior mirror C622-2, circuit 945 (YE/BK), the harness side.</li> </ul>  <p>N0089080</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> CHECK the RH exterior mirror jumper harness between the vehicle harness and the exterior mirror motor for open circuits and damaged or pushed-out pins. If the jumper harness is not OK, REPAIR the jumper harness. If the jumper harness cannot be repaired, INSTALL a new RH exterior mirror. REFER to <u>Exterior Mirror</u> in this section. If the jumper harness is OK, INSTALL a new exterior mirror motor. REFER to <u>Exterior Mirror Motor</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>B4 CHECK THE EXTERIOR MIRROR CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Exterior Mirror Control Switch C527.</li> <li>• Carry out the Exterior Mirror Control Switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <b>149</b> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Did the exterior mirror control switch pass the component test?</b></li> </ul>	<p><b>Yes</b> GO to <b>B5</b>.</p> <p><b>No</b> INSTALL a new exterior mirror control switch. REFER to <u>Exterior Mirror Control Switch</u> in this section. TEST the system for normal operation.</p>
<b>B5 CHECK CIRCUIT 945 (YE/BK) FOR AN OPEN</b>	



<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LH Exterior Mirror C516 .</li> <li>• Measure the resistance between exterior mirror control switch C527-6, circuit 945 (YE/BK), harness side and LH exterior mirror C516-2, circuit 945 (YE/BK), harness side.</li> </ul>  <p style="text-align: center;">N0089080</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> CHECK the LH exterior mirror jumper harness between the vehicle harness and the exterior mirror motor for open circuits and damaged or pushed-out pins. If the jumper harness is not OK, REPAIR the jumper harness. If the jumper harness cannot be repaired, INSTALL a new LH exterior mirror. REFER to <u>Exterior Mirror</u> in this section. If the jumper harness is OK, INSTALL a new exterior mirror motor. REFER to <u>Exterior Mirror Motor</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
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### Pinpoint Test C: A Single Mirror Does Not Function with Switch Logic

Refer to Wiring Diagrams Cell 124 , Power Mirrors for schematic and connector information.

#### Normal Operation

Under normal operation, the exterior mirror control switch uses circuits 940 (DB/OG), 942 (RD/OG), 943 (VT/OG), 944 (DG/OG) and 945 (YE/BK) to control the exterior mirror motor movement. The exterior mirror switch controls the LH exterior mirror motor movement by switching voltage and ground to circuits 940 (DB/OG), 942 (RD/OG) and 945 (YE/BK). The exterior mirror switch controls the RH exterior mirror motor movement by switching voltage and ground to circuits 943 (VT/OG), 944 (DG/OG) and 945 (YE/BK).

#### Mirror Movement

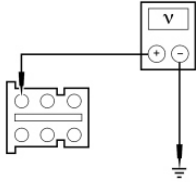
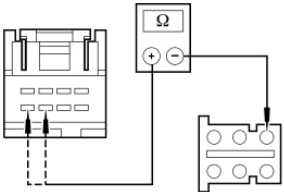
- When the LH/RH exterior mirror motor receives ground through circuit 940 (DB/OG)/943 (VT/OG) and voltage through circuit 945 (YE/BK), the LH/RH exterior mirror motor will operate downward.
- When the LH/RH exterior mirror motor receives voltage through circuit 940 (DB/OG)/943 (VT/OG) and ground through circuit 945 (YE/BK), the LH/RH exterior mirror motor will operate upward.
- When the LH/RH exterior mirror motor receives ground through circuit 942 (RD/OG)/944 (DG/OG) and voltage through circuit 945 (YE/BK), the LH/RH exterior mirror motor will operate rightward.
- When the LH/RH exterior mirror motor receives voltage through circuit 942 (RD/OG)/944 (DG/OG) and ground through circuit 945 (YE/BK), the LH/RH exterior mirror motor will operate leftward.

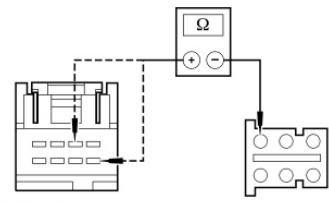
#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Exterior mirror control switch
- Exterior mirror motor
- Exterior mirror

## PINPOINT TEST C: A SINGLE MIRROR DOES NOT FUNCTION WITH SWITCH LOGIC

Test Step	Result / Action to Take
<b>C1 CHECK THE MIRROR MOVEMENT (LEFT/RIGHT)</b>	
<ul style="list-style-type: none"> <li>Operate the RH and LH exterior mirrors in the right and left direction using the exterior mirror control switch.</li> <li><b>Do the exterior mirrors move left and right?</b></li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> GO to <u>C3</u> .</p>
<b>C2 CHECK THE MIRROR MOVEMENT (UP/DOWN)</b>	
<ul style="list-style-type: none"> <li>Operate the LH and RH exterior mirrors in the up and down direction.</li> <li><b>Do the exterior mirrors move up and down?</b></li> </ul>	<p><b>Yes</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C4</u> .</p>
<b>C3 CHECK THE VOLTAGE TO THE INOPERATIVE MIRROR</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Inoperative Exterior Mirror C516 (LH) or C622 (RH).</li> <li><b>NOTE:</b> Position the exterior mirror control switch to the LH or RH mirror position.</li> <li>While operating the exterior mirror control switch in the LEFT position, measure the voltage between ground and exterior mirror: <ul style="list-style-type: none"> <li>♦ <b>LH:</b> C516-3, circuit 942 (RD/OG), harness side.</li> <li>♦ <b>RH:</b> C622-3, circuit 944 (DG/OG), harness side.</li> </ul> </li> </ul> <div> <p>N0068494</p> </div> <ul style="list-style-type: none"> <li><b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> CHECK the RH or LH exterior mirror jumper harness between the vehicle harness and the exterior mirror motor for open circuits and damaged or pushed-out pins. If the jumper harness is not OK, REPAIR the jumper harness. If the jumper harness cannot be repaired, INSTALL a new RH or LH exterior mirror. REFER to <u>Exterior Mirror</u> in this section. If the jumper harness is OK, INSTALL a new RH or LH exterior mirror motor. REFER to <u>Exterior Mirror Motor</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C5</u> .</p>
<b>C4 CHECK THE VOLTAGE TO THE INOPERATIVE MIRROR</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Exterior Mirror C516 (LH) or C622 (RH).</li> <li>• <b>NOTE:</b> Position the exterior mirror control switch to the LH or RH mirror position.</li> <li>• While operating the exterior mirror control switch in the UP position, measure the voltage between ground and exterior mirror:             <ul style="list-style-type: none"> <li>♦ <b>LH:</b> C516-1, circuit 940 (DB/OG), harness side.</li> <li>♦ <b>RH:</b> C622-1, circuit 943 (VT/OG), harness side.</li> </ul> </li> </ul>  <p>N0068495</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> CHECK the RH or LH exterior mirror jumper harness between the vehicle harness and the exterior mirror motor for open circuits and damaged or pushed-out pins. If the jumper harness is not OK, REPAIR the jumper harness. If the jumper harness cannot be repaired, INSTALL a new RH or LH exterior mirror. REFER to <u>Exterior Mirror</u> in this section. If the jumper harness is OK, INSTALL a new RH or LH exterior mirror motor. REFER to <u>Exterior Mirror Motor</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C6</u> .</p>
<p><b>C5 CHECK CIRCUIT 942 (RD/OG) OR CIRCUIT 944 (DG/OG) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Exterior Mirror Control Switch C527.</li> <li>• <b>Inoperative LH mirror:</b> Measure the resistance between exterior mirror control switch C527-8, circuit 942 (RD/OG), harness side and LH exterior mirror C516-3, circuit 942 (RD/OG), harness side.</li> <li>• <b>Inoperative RH mirror:</b> Measure the resistance between exterior mirror control switch C527-7, circuit 944 (DG/OG) harness side and RH exterior mirror C622-3, circuit 944 (DG/OG) harness side.</li> </ul>  <p>N0089081</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new exterior mirror control switch. REFER to <u>Exterior Mirror Control Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>C6 CHECK CIRCUIT 940 (DB/OG) OR CIRCUIT 943 (VT/OG) FOR AN OPEN</b></p>	

<ul style="list-style-type: none"> <li>• <b>Disconnect:</b> Exterior Mirror Control Switch C527.</li> <li>• <b>Inoperative LH mirror:</b> Measure the resistance between exterior mirror control switch C527-5, circuit 940 (DB/OG), harness side and LH exterior mirror C516-1, circuit 940 (DB/OG), harness side.</li> <li>• <b>Inoperative RH mirror:</b> Measure the resistance between exterior mirror control switch C527-2, circuit 943 (VT/OG), harness side and RH exterior mirror C622-1, circuit 943 (VT/OG), harness side.</li> </ul>  <p>N0089082</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new exterior mirror control switch. REFER to <u>Exterior Mirror Control Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
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### Pinpoint Test D: The Heated Exterior Mirror is Inoperative

Refer to Wiring Diagrams Cell 56 , Heated Window for schematic and connector information.

Refer to Wiring Diagrams Cell 124 , Power Mirrors for schematic and connector information.

#### Normal Operation

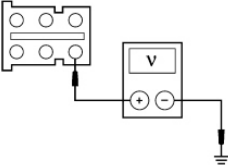
With the engine running and the rear window defrost system ON, the LH and RH exterior mirror glass receives voltage from Battery Junction Box (BJB) fuse 24 (10A) through circuit 59 (DG/VT) and ground through circuit 57 (BK).

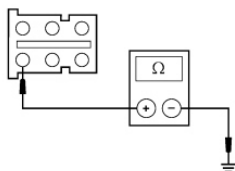
#### This pinpoint test is intended to diagnose the following:

- Fuse
- Heated exterior mirror glass
- Heated exterior mirrors
- Wiring, terminals or connectors

### PINPOINT TEST D: THE HEATED EXTERIOR MIRROR IS INOPERATIVE

Test Step	Result / Action to Take
<b>D1 CHECK THE OPERATION OF THE REAR WINDOW DEFROST SYSTEM</b>	
	<b>Yes</b>

<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Press the rear window defrost switch to the ON position.</li> <li>• Place a hand on the rear window to verify that the rear window heats up.</li> <li>• <b>Does the rear window defrost system operate?</b></li> </ul>	<p>GO to <u>D2</u> .</p> <p><b>No</b> REFER to <u>Section 501-11</u> to continue diagnosis of the heated rear window system.</p>
<b>D2 CHECK THE VOLTAGE TO THE EXTERIOR MIRRORS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Exterior Mirror C516 (LH) or C622 (RH).</li> <li>• Ignition ON.</li> <li>• Press the rear window defrost switch to the ON position.</li> <li>• Measure the voltage between ground and inoperative exterior mirror: <ul style="list-style-type: none"> <li>♦ <b>LH:</b> C516-6 circuit 59 (DG/VT), harness side.</li> <li>♦ <b>RH:</b> C622-6, circuit 59 (DG/VT), harness side.</li> </ul> </li> </ul>  <p>A0042265</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> VERIFY the BJB fuse 24 (10A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<b>D3 CHECK THE EXTERIOR REAR VIEW MIRROR GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and exterior mirror: <ul style="list-style-type: none"> <li>♦ <b>LH:</b> C516-4, circuit 57 (BK), harness side.</li> <li>♦ <b>RH:</b> C622-4, circuit 57 (BK), harness side.</li> </ul> </li> </ul>	<p><b>Yes</b> CHECK the LH or RH exterior mirror jumper harness between the vehicle harness and the exterior mirror glass for open circuits and damaged or pushed-out pins. If the jumper harness is not OK, REPAIR the jumper harness. If the jumper harness cannot be repaired, INSTALL a new LH or RH exterior mirror. REFER to <u>Exterior Mirror</u> in this section. If the jumper harness is OK, INSTALL a new LH or RH exterior mirror glass. REFER to <u>Exterior Mirror Glass</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>




A0042266

- Is the resistance less than 5 ohms?

**Rear View Mirrors - Interior**

## Special Tool(s)

	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
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**Principles of Operation****Interior Auto-Dimming Rear View Mirror**

The interior auto-dimming rear view mirror automatically reduces the glare caused by headlamps reflecting in the interior rear view mirror. The auto-dimming feature is disabled when the vehicle is in REVERSE. Power is supplied to the interior auto-dimming mirror when the ignition is in the RUN or ACC position.

The interior auto-dimming rear view mirror has 2 photoelectric sensors that detect forward and rearward light conditions, and based on those inputs, adjusts the reflectance level of the interior rear view mirror to eliminate unwanted glare. The reflectance level of the mirror glass is variable and depends on the amount of rear glare in relation to ambient light conditions in front of the interior mirror.

When the forward sensor detects daytime conditions, the rearward sensor is inactive, and the mirror glass stays in a high reflectance mode. When the forward sensor detects nighttime conditions, the rearward sensor is active and detects glare from the headlights of vehicles approaching from the rear, or other glare producing light sources. To provide increased visibility when backing up, the interior rear view mirror glass will automatically return to a high reflectance mode whenever the selector lever is placed in REVERSE.

If the forward or rearward sensors are blocked, the auto-dimming interior rear view mirror might not work correctly.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Interior rear view mirror</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse 9 (7.5A)</li> <li>• Interior auto-dimming rear view mirror</li> </ul>

	<ul style="list-style-type: none"> <li>• Loose or corroded connections</li> <li>• Wiring harness</li> </ul>
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3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and GO to Symptom Chart - Interior Mirror or GO to Symptom Chart - NVH.

### Symptom Chart - Interior Mirror

Symptom Chart - Interior Mirror

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

#### ConditionPossible SourcesAction

- The interior mirror vibrates/loose
- Interior mirror mounting loose
- REMOVE the interior mirror. REFER to Interior Rear View Mirror in this section. INSPECT the interior mirror mount for damage. INSTALL the interior mirror, making sure that it is fully seated.

### Pinpoint Tests

#### Pinpoint Test E: The Auto Dimming Mirror Does Not Operate Correctly

Refer to Wiring Diagrams Cell 124, Power Mirrors for schematic and connector information.

#### Normal Operation

The interior auto-dimming mirror receives voltage from Central Junction Box (CJB) fuse 9 (7.5A) through circuit 964 (DB/LG) and ground from circuit 57 (BK). When the vehicle is placed in REVERSE, voltage is sent to the interior mirror through circuit 140 (BK/PK) and the interior mirror will turn the dimming feature off. There are 2 photoelectric sensors: one in the front of the interior rear view mirror and one mounted on the glass side of the mirror. If the sensors are blocked, the interior auto-dimming mirror might not work correctly. Always verify both sensors are not physically blocked before attempting to diagnose auto-dimming mirror



concerns.

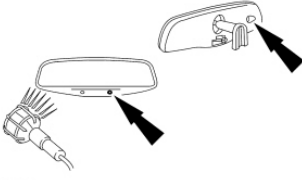
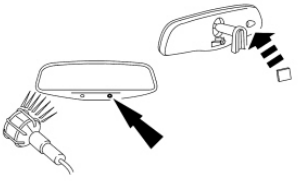
**This pinpoint test is intended to diagnose the following:**

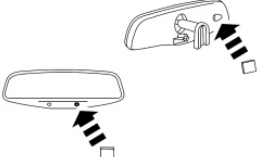
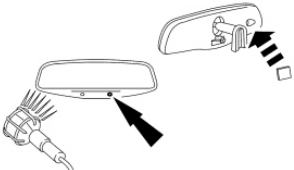
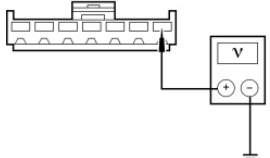
- Fuse
- Interior auto-dimming mirror
- Wiring, terminals or connectors

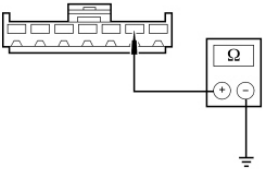
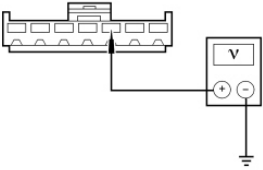
#### **PINPOINT TEST E: THE AUTO-DIMMING MIRROR DOES NOT OPERATE CORRECTLY**

**NOTE:** If the Transmission Range (TR) sensor is malfunctioning and the backup lamps are on all the time or do not turn on, the auto-dimming interior mirror will not darken or return to normal view.

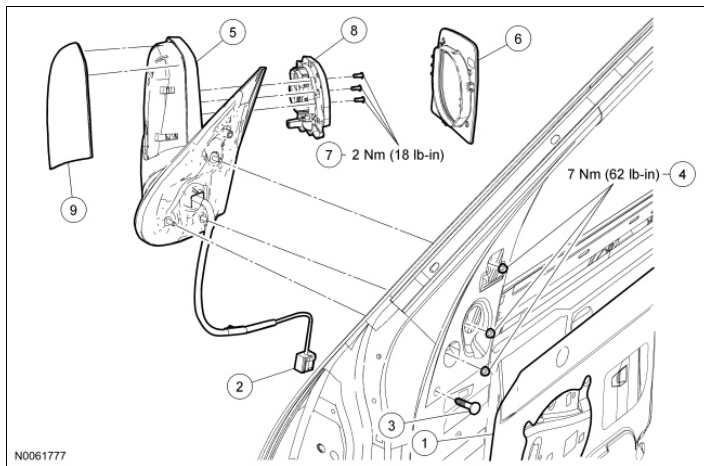
<b>Test Step</b>	<b>Result / Action to Take</b>
<b>E1 CHECK THE OPERATION OF THE BACKUP LAMPS</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Move the selector lever through the entire range.</li> <li>• <b>Do the backup lamps illuminate only in REVERSE?</b></li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> to diagnose the backup lamps.</p>
<b>E2 VERIFY THE FORWARD AND REARWARD FACING SENSORS ARE NOT BLOCKED</b>	
<ul style="list-style-type: none"> <li>• Visually verify the forward and rearward facing sensors are not blocked. Sources of blockage can include: <ul style="list-style-type: none"> <li>◆ stickers, window decals, or tags.</li> <li>◆ fold-down screens for TVs or DVD players.</li> <li>◆ non-OEM window tinting.</li> </ul> </li> <li>• <b>Are either of the sensors blocked?</b></li> </ul>	<p><b>Yes</b> If possible, REMOVE the blockage. TEST the system for normal operation. If the blockage cannot be removed, REVIEW the operation of the interior auto-dimming mirror with the customer.</p> <p><b>No</b> GO to <u>E3</u> .</p>
<b>E3 CHECK THE OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - DAYLIGHT CONDITIONS</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Use a bright lamp to illuminate the forward facing sensor and the rearward facing sensor. The mirror should adjust to a high reflectance mode (mirror will be clear).</li> </ul>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> INSTALL a new interior mirror. REFER to <u>Interior Rear View Mirror</u> in this section. TEST the system for normal operation.</p>

 <p>N0057545</p> <ul style="list-style-type: none"> <li>• Does the mirror adjust to the high reflectance (clear) mode?</li> </ul>	
<b>E4 CHECK THE OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - NIGHTTIME CONDITIONS WITH GLARE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>NOTE:</b> Covering the sensor with a finger or hand is not adequate.</li> <li>• Simulate nighttime conditions with glare: <ul style="list-style-type: none"> <li>♦ cover the forward-facing sensor with black electrical tape or other dark material.</li> <li>♦ illuminate the rearward-facing sensor. The mirror should darken to a lower reflectance mode.</li> </ul> </li> </ul>  <p>N0057546</p> <ul style="list-style-type: none"> <li>• Does the mirror darken to a lower reflectance (darker) mode?</li> </ul>	<p><b>Yes</b> GO to <u>E5</u> .</p> <p><b>No</b> GO to <u>E7</u> .</p>
<b>E5 CHECK THE OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - NIGHTTIME CONDITIONS WITHOUT GLARE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>NOTE:</b> Covering the sensor with a finger or hand is not adequate.</li> <li>• Simulate nighttime conditions without glare: <ul style="list-style-type: none"> <li>♦ cover the forward-facing sensor with black electrical tape or other dark material.</li> <li>♦ cover the rearward-facing sensor. The mirror should adjust to the high reflectance mode.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>E6</u> .</p> <p><b>No</b> GO to <u>E7</u> .</p>

 <p>N0057547</p> <ul style="list-style-type: none"> <li>• Does the mirror adjust to the high reflectance (clear) mode?</li> </ul>	
<p><b>E6 CHECK THE OPERATION OF THE INTERIOR AUTO-DIMMING MIRROR - NIGHTTIME CONDITIONS WITH THE VEHICLE IN REVERSE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>NOTE:</b> Covering the sensor with a finger or hand is not adequate.</li> <li>• Simulate nighttime conditions with glare: <ul style="list-style-type: none"> <li>◆ cover the forward-facing sensor with black electrical tape or other dark material.</li> <li>◆ illuminate the rearward-facing sensor.</li> </ul> </li> </ul>  <p>N0057546</p> <ul style="list-style-type: none"> <li>• Select REVERSE.</li> <li>• Did the mirror adjust to a high reflectance (clear) mode?</li> </ul>	<p><b>Yes</b> The system is operating normally at this time. REVIEW operation of the interior auto-dimming mirror feature with the customer.</p> <p><b>No</b> GO to <u>E7</u> .</p>
<p><b>E7 CHECK CIRCUIT 964 (DB/LG) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Interior Auto-dimming Mirror C911.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between interior auto-dimming mirror C911-1, circuit 964 (DB/LG), harness side and ground.</li> </ul>  <p>A0073174</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>E8</u> .</p> <p><b>No</b> VERIFY CJB fuse 9 (7.5A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>

E8 CHECK CIRCUIT 57 (BK) FOR AN OPEN	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between interior auto-dimming mirror C911-2, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0073175</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E9</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
E9 CHECK CIRCUIT 140 (BK/PK) FOR AN OPEN	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Select REVERSE.</li> <li>• Measure the voltage between interior auto-dimming mirror C911-3, circuit 140 (BK/PK), harness side and ground.</li> </ul>  <p>A0073178</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new interior rear view mirror. REFER to <u>Interior Rear View Mirror</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>



**Exterior Mirrors - Exploded View**

Item	Part Number	Description
1	-	Water shield
2	-	Electrical connector (part of 14A005)
3	-	Pin-type retainer (1 required)
4	N621906	Exterior mirror nuts (3 required)
5	17682	Exterior mirror assembly
6	17K707	Exterior mirror glass
7	-	Exterior mirror motor screws (3 required)
8	17D696	Exterior mirror motor
9	17D742	Exterior mirror cover

1. For additional information, refer to the procedures in this section.



## **Exterior Mirror**

### **Removal and Installation**

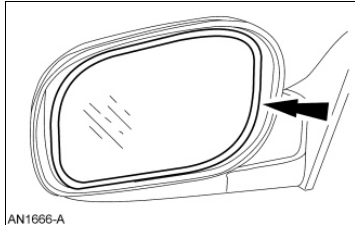
1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#) .
  2. Position the water shield aside.
  3. Remove the pin-type retainer.
  4. Through the door opening, disconnect the power exterior mirror electrical connector.
  5. Remove the 3 nuts and the exterior mirror.
    - To install, tighten to 7 Nm (62 lb-in).
  6. To install, reverse the removal procedure.
-



---

**Exterior Mirror Glass****Removal and Installation**

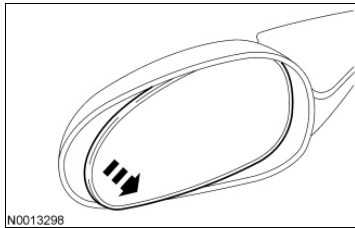
1. Push in the upper edge of the exterior mirror glass to the maximum travel.



2. **⚠ WARNING:** Place a shop towel between the hands and the exterior mirror glass for protection in case of glass breakage during mirror service. Failure to follow this instruction may result in serious personal injury.

Gently pull outward until the exterior mirror glass is released.

- If equipped, disconnect the mirror glass electrical connector.



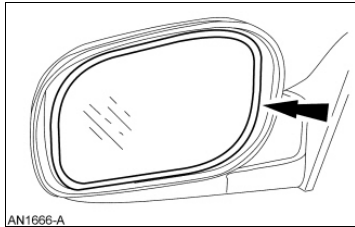
3. To install, reverse the removal procedure.
-



## Exterior Mirror Motor

### Removal and Installation

1. Remove the exterior mirror glass. For additional information, refer to [Exterior Mirror Glass](#) in this section.

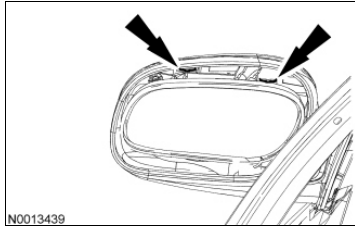


2. Remove the exterior mirror motor screws.
    - To install, tighten to 2 Nm (18 lb-in).
  3. Disconnect the electrical connectors and remove the motor.
  4. To install, reverse the removal procedure.
-

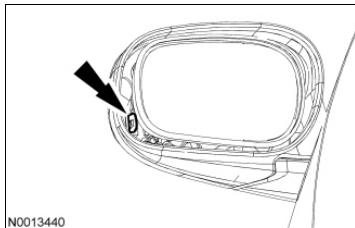
## Exterior Mirror Cover

### Removal

1. Position the exterior mirror glass in the full downward position.
2. Using a suitable tool, release the 2 locking tabs from the exterior mirror cover.



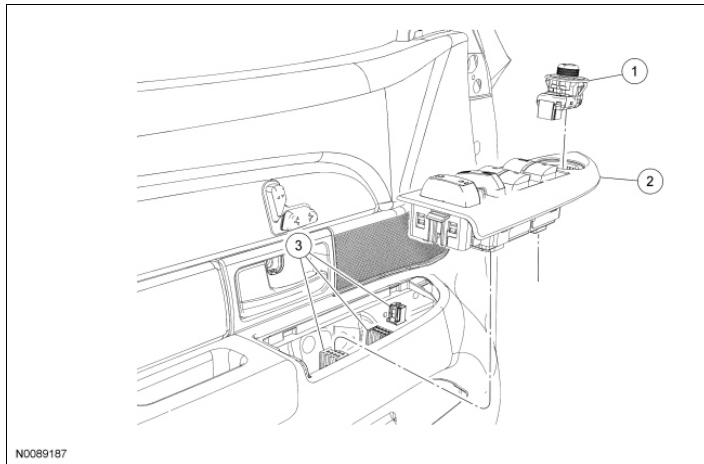
3. Position the exterior mirror glass in the full in position.
4. Using a suitable tool, release the locking tab and remove the exterior mirror cover.



### Installation

1. Position the exterior mirror cover on the exterior mirror.
  2. Place a hand against the back of the exterior mirror cover and press the cover in place until it is fully seated.
-

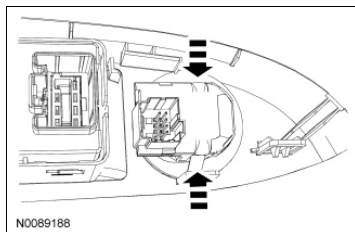


**Exterior Mirror Control Switch**

Item	Part Number	Description
1	17B676	Exterior mirror control switch
2	14527	Window regulator switch plate
3	-	Electrical connectors (part of 14A005)

**Removal and Installation**




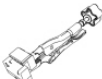
1. Lift the front of the window regulator switch plate from the front door trim panel and position the switch plate aside.
2. Release the 2 locking tabs and remove the exterior mirror control switch.
  - Disconnect the electrical connector.

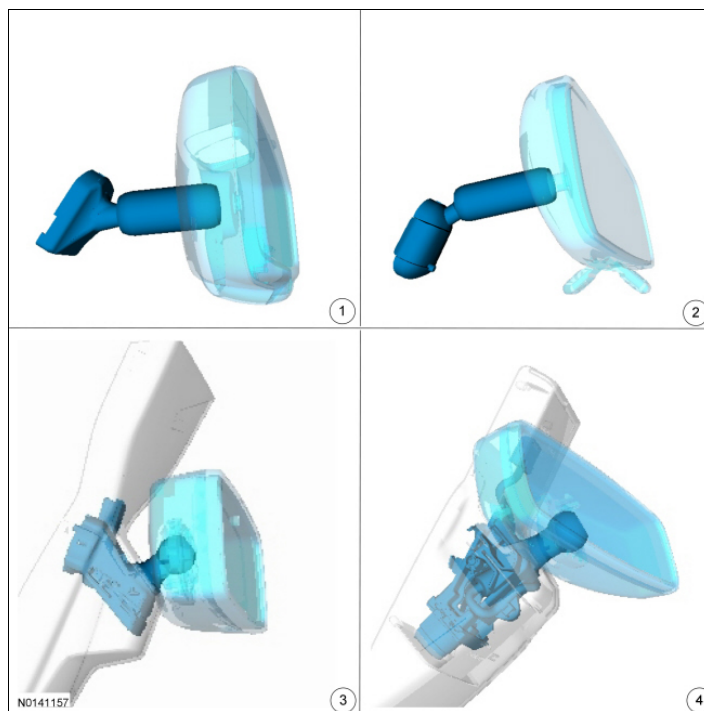


3. To install, reverse the removal procedure.



**Interior Rear View Mirror****Special Tool(s)**

 ST1793-A	Installer, Rear View Mirror 501-025 (T94P-17700-AH)
 ST3250-A	Mirror Remover 501-D118A
 ST3311-A	Installer, Rear View Mirror 501-191
 ST3310-A	Mirror Remover 501-190

**Mirror Identification**

Item	Part Number	Description
1	-	Mirror type 1
2	-	Mirror type 2
3	-	Mirror type 3
4	-	Mirror type 4

**Removal**

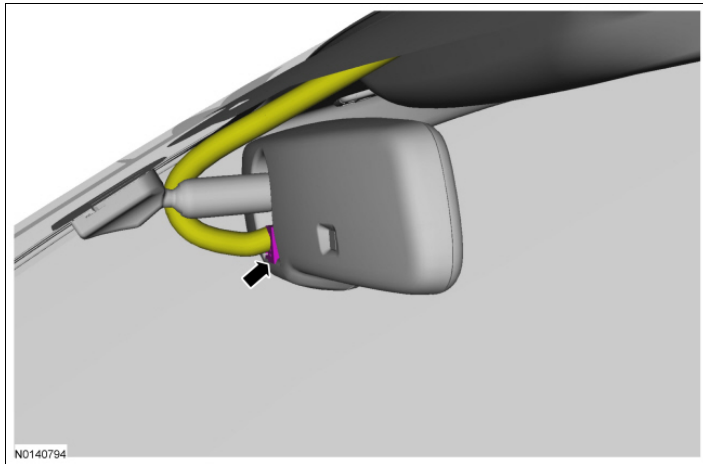


## Mirror Type 1

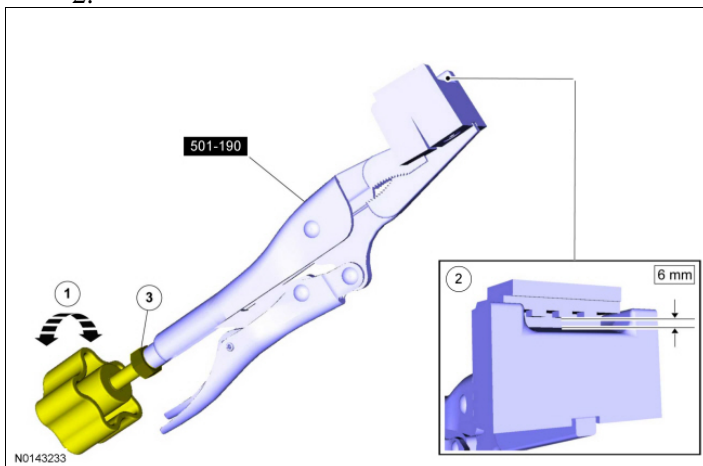
**NOTICE:** The windshield must be at room temperature. Otherwise, damage to the windshield glass may occur.

**NOTE:** [Click here to view a video version of this procedure.](#)

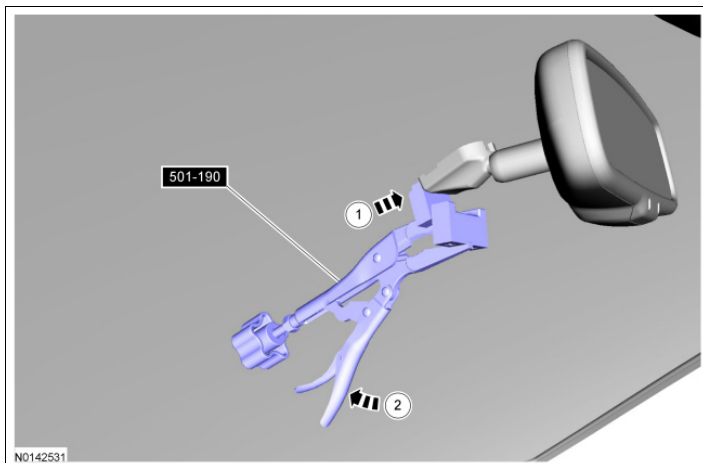
1. If equipped.



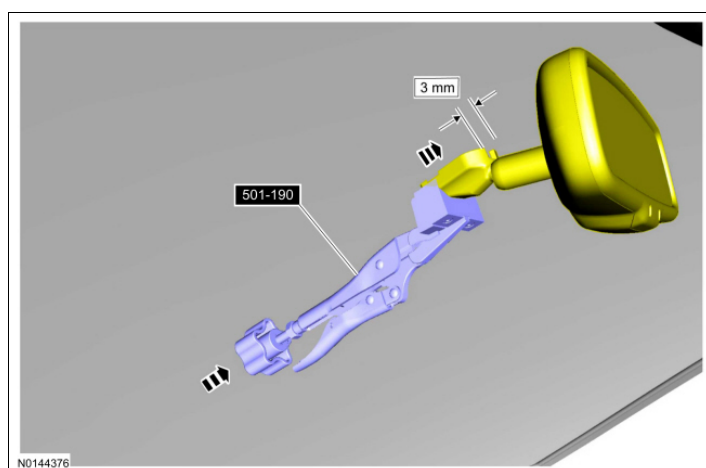
- 2.



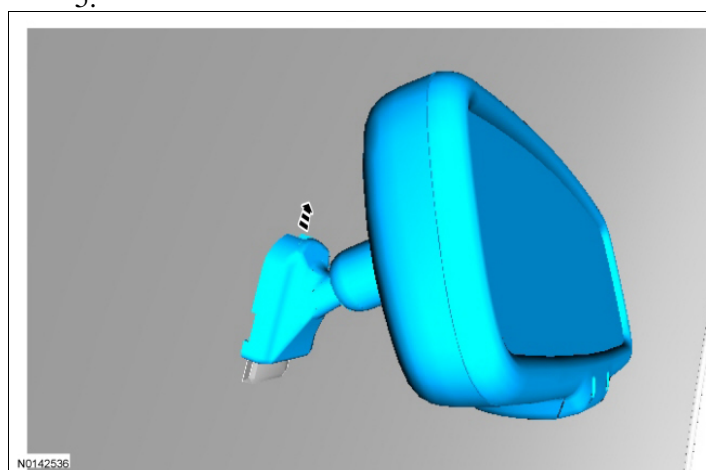
3. **NOTICE:** Make sure the Mirror Remover is fully inserted into the interior rear view mirror mount access hole. Otherwise, damage to the windshield glass may occur.



4. Using a closed hand, bump the adjustment handle of the Mirror Remover to slide the mirror upward on the mirror mount.

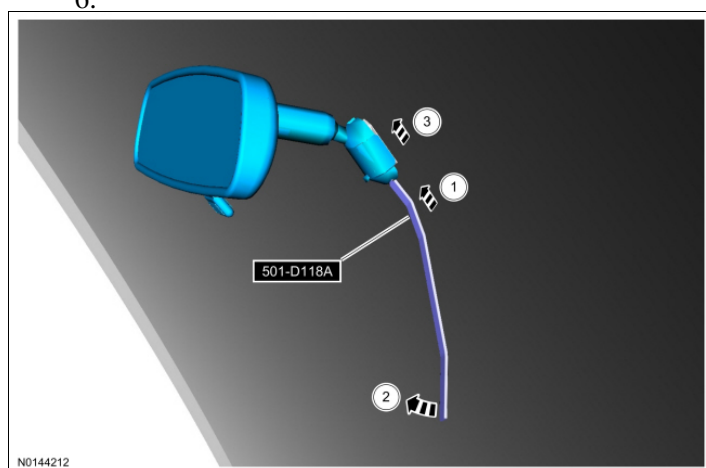


- 5.



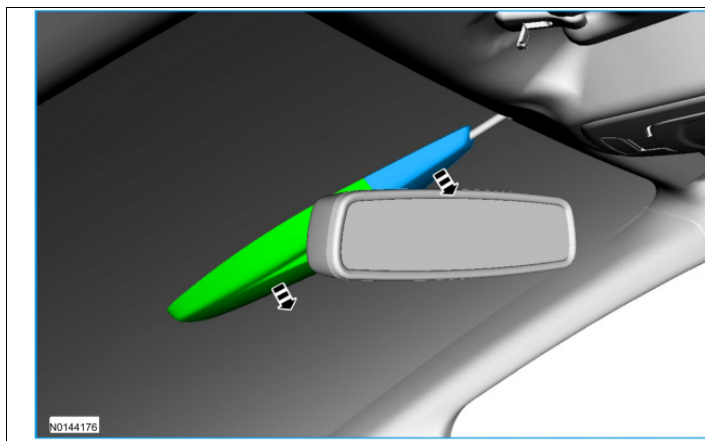
## Mirror Type 2

- 6.

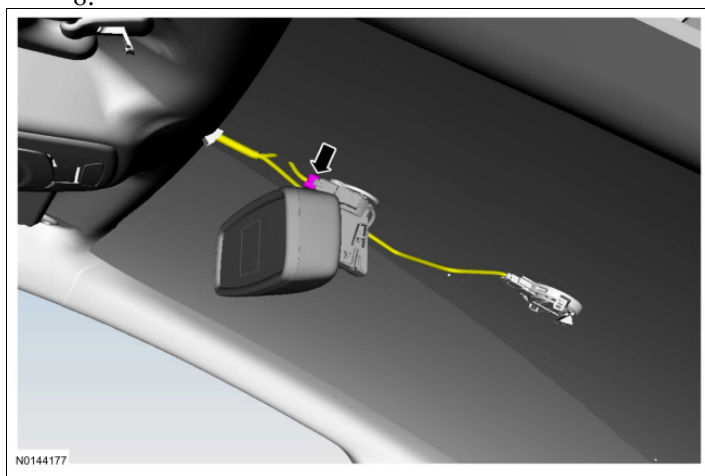


## Mirror Type 3

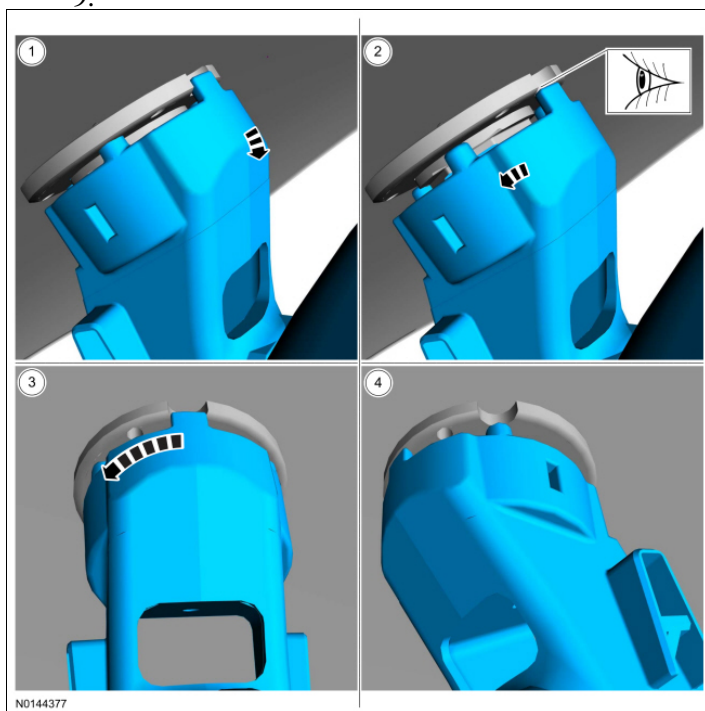
- 7.



8.



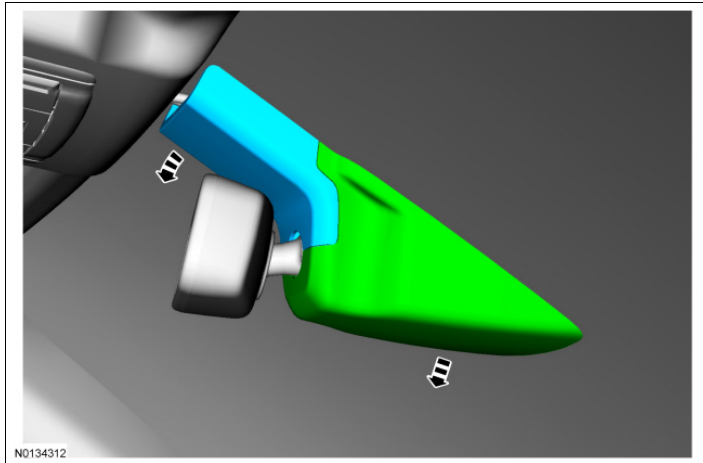
9.



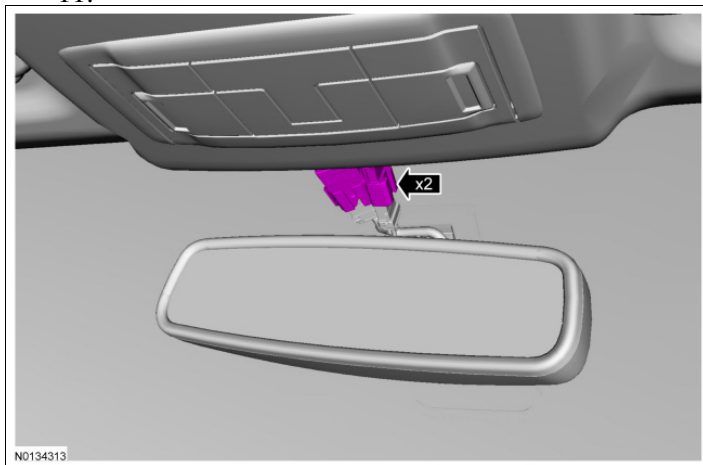
#### Mirror Type 4

10.

#### Mirror Identification

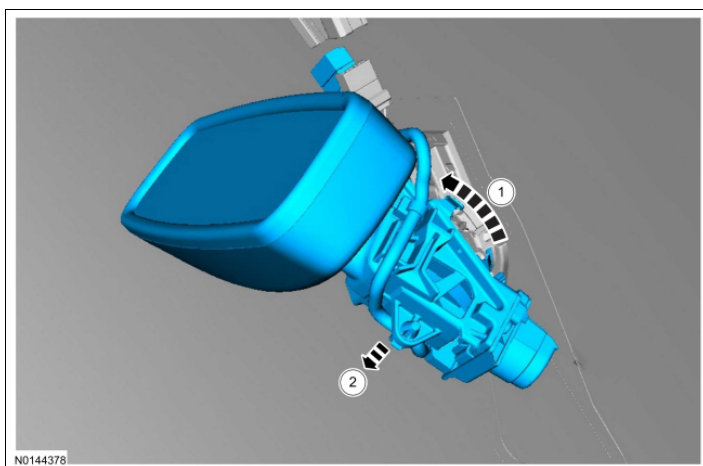


11.



12. **NOTICE:** To prevent damage to the mirror or base, rotate the mirror base with hands only do not use tools.

**NOTICE:** To prevent damage to the mirror wiring, do not rotate the mirror head beyond 180 degrees.



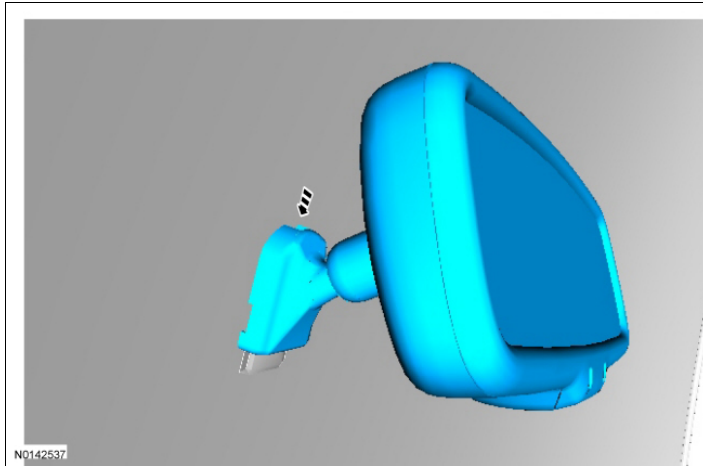
## Installation

### Mirror Type 1

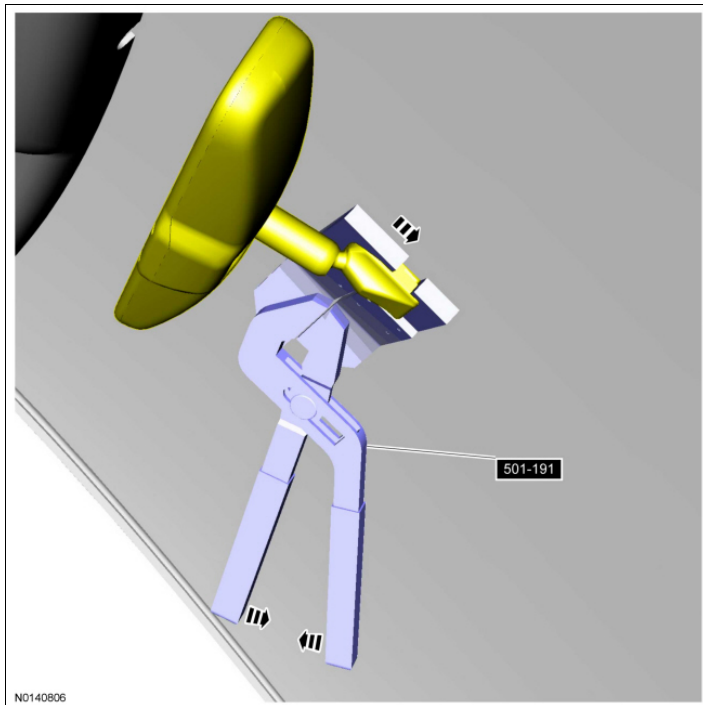
**NOTE:** [Click here to view a video version of this procedure.](#)

### Mirror Identification

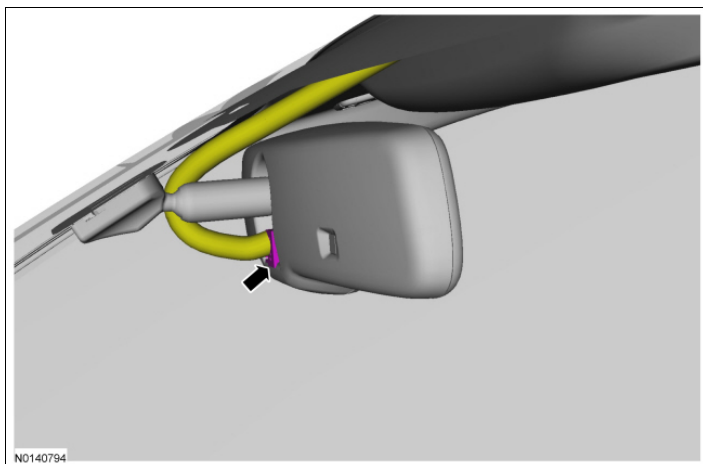
1. Slide the interior rear view mirror mount over the windshield bracket from the top.



2. **NOTE:** An audible click will be heard as the mirror fully seats.



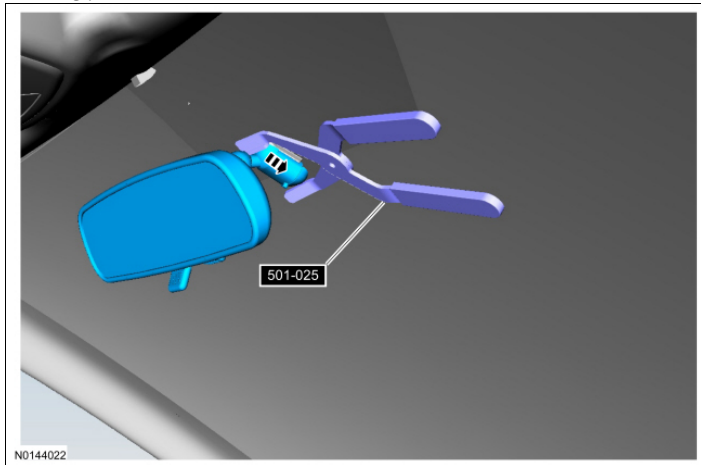
3. If equipped.



4. If equipped with compass module, check the compass zone and calibration. Refer to General Procedures in Section 413-01 or Section 419-11.

### Mirror Type 2

5.



6. If equipped with a compass module which requires calibration, check the compass zone adjustment and calibration. Refer to General Procedures in Section 413-01 or Section 419-11.

### Mirror Type 3

7. To install, reverse the removal procedure.

### Mirror Type 4

8. To install, reverse the removal procedure.
    - If a new mirror has been installed, download the IPM-A configuration information from the scan tool to the new IPM-A .
    - If a new mirror has been installed, perform camera alignment using a scan tool.
-



**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Front seat armrest bracket bolts	9	-	80
Front seat backrest pivot bolt	45	33	-
Front seat safety belt buckle nut	48	35	-
Front seat track-to-floor bolts	25	18	-
Front seat track-to-floor nut, inboard	80	59	-
Front seat track-to-floor nut, outboard	25	18	-
Rear seat armrest bracket nuts	5	-	44
Rear seat backrest nuts	55	41	-
Seat manual recliner-to-seat track bolts	55	41	-
Seat power recliner-to-seat track bolts	55	41	-
Seat recliner-to-backrest bolts	55	41	-
Seat track-to-cushion frame bolts	20	-	177
Side air bag module nuts	7	-	62



## Seats

### Front Seats

The driver and passenger front seats can be equipped with the following serviceable items:

- Six-way power seat tracks
- Power seat switches attached to the driver and passenger front door panels
- Two-way manual seat tracks
- Power recliner attached to the cushion and backrest frames
- Manual recliners attached to the cushion and backrest frames
- Power lumbar assemblies mounted to the backrest frames
- Power lumbar control switches attached to the seat cushions
- Seat side air bags in the backrest assemblies
- Heated seat cushions and backrests
- Heated seat switches attached to the driver and passenger front door panels
- Armrests mounted to the seat cushion frames (50 percent seats)
- Occupant Classification Sensor (OCS) system (passenger seat cushion only)
- Safety belt buckles attached to the seat tracks

### Power Seat Track

The power seat track motors move the seat horizontally and vertically (front and rear height). The seat track motors are serviceable only as a seat track assembly.

### Power Recliner

The power recliner motor moves the seat backrest backward or forward. The power recliner is a modular design and incorporated into the inertia front seat backrest latch. The power recliner motor is not serviceable separately. If the power recliner needs to be repaired, the entire front seat backrest latch must be installed new.

### Power Lumbar

The driver seat has an electro-mechanical backrest pad adjuster mounted to the backrest frame to provide more lower body displacement. The lumbar switch is located on the side of the seat cushion. The power lumbar includes an electric air compressor and air bladder that inflates or deflates to move the backrest foam pad in and out for lumbar support adjustment.

### Seat Side Air Bag

Driver and passenger seat side air bags are attached to the seat backrest frames. For diagnostic information, or if the seat side air bag has deployed, refer to Section 501-20B.

### Heated Seat

**NOTE:** The heater mat on the front passenger seat cushion is not serviceable separately. If a new heater mat is needed on the front passenger seat cushion, a new OCS system service kit and a new heater mat must be installed. Refer to Section 501-20B .

**NOTE:** If a driver seat heater mat (cushion or backrest) or passenger seat backrest heater mat is faulty, a new foam pad must be installed with the new heater mat. Do not reuse the original foam pad.

The heated seats system includes the following serviceable components:

- Driver and passenger heated seat modules attached underneath the seat cushion frames
- Heater mats attached to the seat cushions and backrests
- Heated seat switches attached to the driver and passenger front door panels

### **Occupant Classification Sensor (OCS)**

The OCS system is standard equipment on all front passenger seats. For information on diagnosing or servicing the OCS system, refer to Section 501-20B .

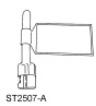


### **Belt Tension Sensor (BTS)**

The Belt Tension Sensor (BTS) is part of the safety belt buckle on the front passenger seat only. It is part of the Supplemental Restraint System (SRS). It connects electrically to the passenger seat wiring harness. For diagnostic information, refer to Section 501-20B . For specific removal and installation information, refer to Section 501-20A .

---

**Seats**

## Special Tool(s)

	Diagnostic Service Tool, Restraint System (2 required) 418-133
	Flex Probe Kit 105-R025C or equivalent
	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent

**Restraint System Diagnostic Service Tool Warning**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**Principles of Operation****Front Power Seats**

The driver and front passenger power seat motors are hardwired to the seat control switches on each respective front door trim panel. The seat motor circuits are all normally grounded through the seat control switch (rest position). The seat control switch supplies voltage and ground to the appropriate motor on the seat track or recliner motor (if equipped) when a seat adjustment position is selected.

**Heated Seats**

**NOTE:** The heater mat on the front passenger seat cushion is not serviceable separately. If a new heater mat is needed on the front passenger seat cushion, a new Occupant Classification Sensor (OCS) system service kit and a new heater mat must be installed. Refer to [Section 501-20B](#).

**NOTE:** If a driver seat heater mat (cushion or backrest) or passenger seat backrest heater mat is faulty, a new foam pad must be installed with the new heater mat. Do not reuse the original foam pad.

Vehicles equipped with front heated seats have a heated seat module located under each front seat. The driver and passenger heated seat modules share a common battery voltage supply circuit and a common ignition voltage supply circuit. The engine must be running to operate the heated seat system. When the heated seat switch is pressed, a ground signal is sent to the heated seat module on either the high or low enable circuits to command the system on or off. The heated seat module also supplies ground circuits to the high and low indicators in the heated seat switch. The heated seat module also supplies voltage and ground to the cushion

and backrest heater mats. The backrest and cushion heater mats are connected in parallel and operate together. The heated seat module controls the seat temperature by monitoring resistance of a temperature sensor (thermistor) contained within the cushion heater mat and controls the output current to the heater mats. The heated seat module is designed to maintain seat temperature until the system times-out, is switched off or engine is no longer running. The temperature sensor is not serviceable separately, a new sensor must be installed as part of the cushion heater mat or foam pad.

### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Loose or damaged seat mounting hardware</li> <li>• Front seat tracks obstructed</li> <li>• Seat at limit(s) of travel</li> <li>• Damaged switch(es)</li> <li>• Damaged seat trim cover</li> <li>• Damaged seat track</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB):               <ul style="list-style-type: none"> <li>◆ circuit breaker 601 (20A)</li> <li>◆ fuse 16 (20A)</li> </ul> </li> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 9 (7.5A)</li> <li>◆ 17 (10A)</li> </ul> </li> <li>• Faulty wiring harness</li> <li>• Loose, corroded or damaged connectors</li> <li>• Damaged seat control switch</li> <li>• Damaged lumbar control switch</li> <li>• Damaged heated seat switch</li> <li>• Damaged seat track motor</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom. GO to **Symptom Chart**.

### Symptom Chart

Symptom Chart

### Pinpoint Tests

Refer to Inspection and Verification and the Symptom Chart in this section for direction to the appropriate Pinpoint Test.

**Pinpoint Test A: The Power Seat is Inoperative**

Refer to Wiring Diagrams Cell 120 , Power Seats for schematic and connector information.

**Normal Operation**

The seat control switch is supplied battery voltage on circuit 517 (BK/WH) and is supplied ground on circuit 57 (BK). The seat control switch applies battery voltage and ground directly to one of 3 bi-directional seat track motors, respectively, to move the seat. Toggling the seat control switch in the opposite direction reverses voltage polarity applied to the respective seat motor and moves the seat in the opposite direction.

**This pinpoint test is intended to diagnose the following:**

- Circuit breaker
- Wiring, terminals or connectors
- Seat control switch
- Seat track (motor assembly)

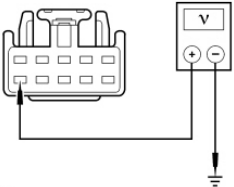
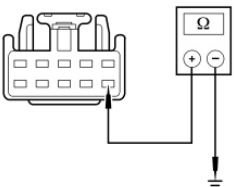
**PINPOINT TEST A: THE POWER SEAT IS INOPERATIVE**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>A1 CHECK THE POWER SEAT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the seat from the seat control switch.</li> <li>• <b>Does the seat move in any direction?</b></li> </ul>	<p><b>Yes</b> VERIFY the symptom. GO to <u>Symptom Chart</u> .</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE VOLTAGE TO THE SEAT CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Driver Seat Side Air Bag C315 or Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool 418-133 to Driver Seat Side Air Bag</li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> VERIFY the Battery Junction Box (BJB) circuit breaker 601 (20A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>

<p>C315 or Passenger Seat Side Air Bag C316.</p> <ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Control Switch C519 or Passenger Seat Control Switch C627.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Measure voltage between driver seat control switch C519-10, circuit 517 (BK/WH), harness side and ground; or between passenger seat control switch C627-10, circuit 517 (BK/WH), harness side and ground.</li> </ul>  <p>N0078865</p> <p>• Is the voltage greater than 10 volts?</p>	<p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315 or passenger seat side air bag module C316. CONNECT driver seat side air bag module C315 or passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>A3 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b></p> <ul style="list-style-type: none"> <li>• Measure resistance between driver seat control switch C519-6, circuit 57 (BK), harness side and ground; or between passenger seat control switch C627-6, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0078866</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315 or passenger seat side air bag module C316. CONNECT driver seat side air bag module C315 or passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>A4 CHECK THE SEAT TRACK FOR AN OBSTRUCTION</b></p> <ul style="list-style-type: none"> <li>• Inspect the seat track for damage or an obstruction.</li> <li>• Is the seat track OK?</li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <u>Seat Control Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable.</p>

	<p>DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315 or passenger seat side air bag module C316. CONNECT driver seat side air bag module C315 or passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315 or passenger seat side air bag module C316. CONNECT driver seat side air bag module C315 or passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
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### Pinpoint Test B: The Power Seat Does Not Move Horizontally/Vertically - Driver

Refer to Wiring Diagrams Cell 120 , Power Seats for schematic and connector information.

#### Normal Operation

When pressed in 1 of 6 possible directions, the seat control switch supplies battery voltage and ground to horizontal motor circuits 980 (YE/WH) and 981 (RD/WH), front height motor circuits 978 (YE/LB) and 979 (RD/LB) or rear height motor circuits 982 (YE/LG) and 983 (RD/LG). The seat control switch is normally closed to ground on all 6 of the seat motor circuits. When the seat control switch is toggled in one direction to supply voltage to a motor circuit, the opposite motor circuit is already connected to ground through the switch supplying voltage and ground to the motor to move the seat. Toggling the seat control switch in the opposite direction reverses polarity to the motor moving the seat in the opposite direction.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Seat control switch
- Power seat motor (seat track)

### PINPOINT TEST B: THE POWER SEAT DOES NOT MOVE HORIZONTALLY/VERTICALLY - DRIVER

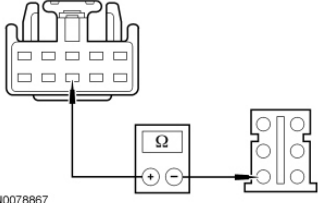
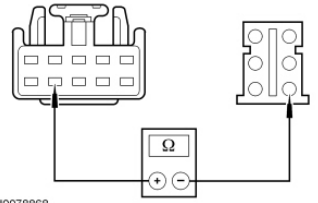
**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

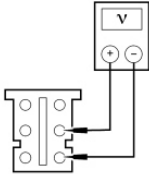
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

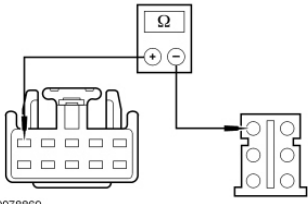
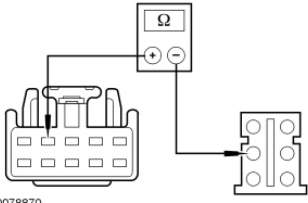
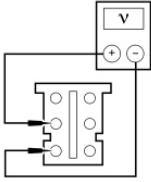
**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

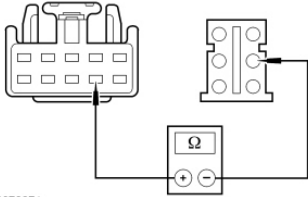
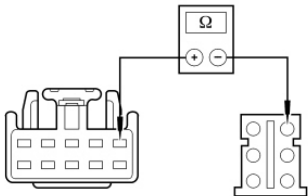
Test Step	Result / Action to Take
<b>B1 CHECK THE HORIZONTAL MOTOR FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the driver power seat forward and rearward.</li> <li>• <b>Does the seat move horizontally?</b></li> </ul>	<p><b>Yes</b> GO to <u>B5</u> .</p> <p><b>No</b> GO to <u>B2</u> .</p>
<b>B2 CHECK THE VOLTAGE TO THE DRIVER SEAT HORIZONTAL MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool 418-133 to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Driver Power Seat Motor C353.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Measure voltage between driver power seat motor C353-4, circuit 980 (YE/WH), harness side and C353-1, circuit 981 (RD/WH), harness side, while pushing the driver seat control switch forward and rearward.</li> </ul> <div> </div> <p>A0081768</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</b></li> </ul>	<p><b>Yes</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>B3</u> .</p>
<b>B3 CHECK THE HORIZONTAL MOTOR CIRCUIT 980 (YE/WH) FOR AN OPEN</b>	



<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Control Switch C519.</li> <li>• Measure resistance between driver seat control switch C519-8, circuit 980 (YE/WH), harness side and driver power seat motor C353-4, circuit 980 (YE/WH), harness side.</li> </ul>  <p>N0078867</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B4</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<p><b>B4 CHECK HORIZONTAL MOTOR CIRCUIT 981 (RD/WH) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between driver seat control switch C519-9, circuit 981 (RD/WH), harness side and driver power seat motor C353-1, circuit 981 (RD/WH), harness side.</li> </ul>  <p>N0078868</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <b>Seat Control Switch</b> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<p><b>B5 DETERMINE THE SEAT HEIGHT ADJUST FAILURE</b></p>	
<ul style="list-style-type: none"> <li>• Determine the seat height adjust failure.</li> <li>• Does the seat front or rear height adjust up and down?</li> </ul>	<p><b>Yes</b> If only the front height adjust operates, GO to <b>B6</b> .</p> <p>If only the rear height adjust operates, GO to <b>B9</b> .</p> <p><b>No</b> INSTALL a new seat control switch. REFER to <b>Seat Control Switch</b> in this section. TEST the system for normal</p>

	<p>operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>B6 CHECK THE VOLTAGE TO THE DRIVER SEAT REAR HEIGHT MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool 418-133 to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Driver Power Seat Motor C353.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Measure voltage between driver power seat motor C353-6, circuit 982 (YE/LG), harness side and C353-5, circuit 983 (RD/LG), harness side, while depressing the seat control switch rear height adjust up and down.</li> </ul>  <p>A0081766</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</b></li> </ul>	<p><b>Yes</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>B7</u> .</p>
<b>B7 CHECK REAR HEIGHT MOTOR CIRCUIT 982 (YE/LG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Control Switch C519.</li> <li>• Measure resistance between driver seat control switch C519-5, circuit 982 (YE/LG), harness side and driver power seat motor C353-6, circuit 982 (YE/LG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>B8</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

 <p>N0078869</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<p><b>B8 CHECK REAR HEIGHT MOTOR CIRCUIT 983 (RD/LG) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between driver seat control switch C519-4, circuit 983 (RD/LG), harness side and driver power seat motor C353-5, circuit 983 (RD/LG), harness side.</li> </ul>  <p>N0078870</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <a href="#">Seat Control Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<p><b>B9 CHECK THE VOLTAGE TO THE DRIVER SEAT FRONT HEIGHT MOTOR</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Power Seat Motor C353.</li> <li>• Measure voltage between driver power seat motor C353-2, circuit 978 (YE/LB), harness side and C353-3, circuit 979 (RD/LB), while pushing the seat control switch front height adjust up and down.</li> </ul>  <p>A0081763</p>	<p><b>Yes</b> INSTALL a new seat track. REFER to <a href="#">Seat Track</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">B10</a> .</p>

<ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</li> </ul>	
<b>B10 CHECK FRONT HEIGHT MOTOR CIRCUIT 978 (YE/LB) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Control Switch C519.</li> <li>• Measure resistance between driver seat control switch C519-7, circuit 978 (YE/LB), harness side and driver power seat motor C353-2, circuit 978 (YE/LB), harness side.</li> </ul>  <p>N0078871</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B11</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<b>B11 CHECK FRONT HEIGHT MOTOR CIRCUIT 979 (RD/LB) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure resistance between driver seat control switch C519-1, circuit 979 (RD/LB) harness side, and driver power seat motor C353-3, circuit 979 (RD/LB), harness side.</li> </ul>  <p>N0078872</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <b>Seat Control Switch</b> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>

### Pinpoint Test C: The Power Seat Does Not Move Horizontally/Vertically - Passenger

Refer to Wiring Diagrams Cell **120** , Power Seats for schematic and connector information.

**Normal Operation**

When pressed in 1 of 6 available directions, the seat control switch supplies battery voltage and ground to horizontal motor circuits 986 (YE/WH) and 987 (RD/WH), front height motor circuits 984 (YE/LB) and 985 (RD/LB) or rear height motor circuits 988 (YE/LG) and 989 (RD/LG). The seat control switch is normally closed to ground on all 6 of the seat motor circuits. When the seat control switch is toggled in one direction to supply voltage to a motor circuit, the opposite motor circuit is already connected to ground through the switch supplying voltage and ground to the motor to move the seat. Toggling the seat control switch in the opposite direction reverses polarity to the motor moving the seat in the opposite direction.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Seat control switch
- Power seat motor (seat track)

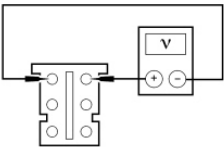
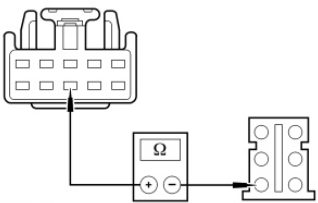
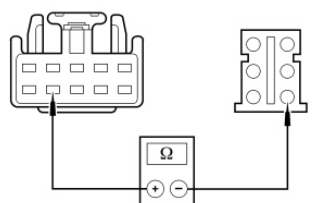
**PINPOINT TEST C: THE POWER SEAT DOES NOT MOVE HORIZONTALLY/VERTICALLY - PASSENGER**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

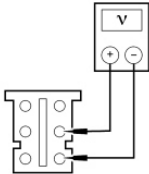
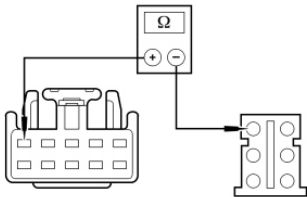
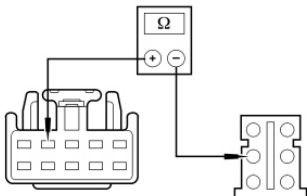
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

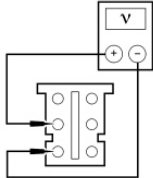
Test Step	Result / Action to Take
<b>C1 CHECK THE HORIZONTAL MOTOR FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the passenger power seat forward and rearward.</li> <li>• <b>Does the seat move horizontally?</b></li> </ul>	<b>Yes</b> GO to <u>C5</u> .  <b>No</b> GO to <u>C2</u> .
<b>C2 CHECK THE VOLTAGE TO THE HORIZONTAL MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool 418-133 to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Power Seat Motor C3015.</li> <li>• <b>⚠ WARNING:</b> Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal</li> </ul>	<b>Yes</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.  DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .

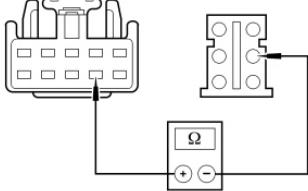
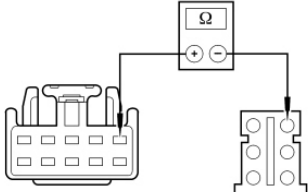
<p><b>injury in the event of an accidental deployment.</b></p> <ul style="list-style-type: none"> <li>• Connect the battery ground cable. Refer to <a href="#">Section 414-01</a> .</li> <li>• Measure voltage between passenger power seat motor C3015-4, circuit 986 (YE/WH), harness side and C3015-1, circuit 987 (RD/WH), harness side, while pushing the passenger seat control switch forward and rearward.</li> </ul>  <p>A0081768</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</b></li> </ul>	<p><b>No</b> GO to <a href="#">C3</a> .</p>
<p><b>C3 CHECK HORIZONTAL MOTOR CIRCUIT 986 (YE/WH) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Control Switch C627.</li> <li>• Measure resistance between passenger seat control switch C627-8, circuit 986 (YE/WH), harness side and passenger power seat motor C3015-4, circuit 986 (YE/WH), harness side.</li> </ul>  <p>N0078867</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">C4</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<p><b>C4 CHECK HORIZONTAL MOTOR CIRCUIT 987 (RD/WH) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between passenger seat control switch C627-9, circuit 987 (RD/WH), harness side and passenger power seat motor C3015-1, circuit 987 (RD/WH), harness side.</li> </ul>  <p>N0078868</p>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <a href="#">Seat Control Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

<ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>C5 DETERMINE THE SEAT HEIGHT ADJUST FAILURE</b>	
<ul style="list-style-type: none"> <li>• Determine the seat height adjust failure.</li> <li>• Does the seat front or rear height adjust up and down?</li> </ul>	<p><b>Yes</b> If only the front height adjust operates, GO to <u>C6</u> .</p> <p>If only the rear height adjust operates, GO to <u>C9</u> .</p> <p><b>No</b> INSTALL a new seat control switch. REFER to <u>Seat Control Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>C6 CHECK THE VOLTAGE TO THE REAR HEIGHT MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool 418-133 to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Power Seat Motor C3015.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> </ul>	<p><b>Yes</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>C7</u> .</p>

<ul style="list-style-type: none"> <li>• Measure voltage between passenger power seat motor C3015-6, circuit 988 (YE/LG), harness side and C3015-5, circuit 989 (RD/LG), harness side, while depressing the seat control switch rear height adjust up and down.</li> </ul>  <p>A0081766</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</b></li> </ul>	
<b>C7 CHECK REAR HEIGHT MOTOR CIRCUIT 988 (YE/LG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Control Switch C627.</li> <li>• Measure resistance between passenger seat control switch C627-5, circuit 988 (YE/LG), harness side and passenger power seat motor C3015-6, circuit 988 (YE/LG), harness side.</li> </ul>  <p>N0078869</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>C8 CHECK REAR HEIGHT MOTOR CIRCUIT 989 (RD/LG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure resistance between passenger seat control switch C627-4, circuit 989 (RD/LG), harness side and passenger power seat motor C3015-5, circuit 989 (RD/LG), harness side.</li> </ul>  <p>N0078870</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <u>Seat Control Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b></p>



	<p>REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>C9 CHECK THE VOLTAGE TO THE FRONT HEIGHT MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool 418-133 to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Power Seat Motor C3015.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Disconnect: Passenger Power Seat Motor C3015.</li> <li>• Measure voltage between passenger power seat motor C3015-2, circuit 984 (YE/LB), harness side and C3015-3, circuit 985 (RD/LB), while pushing the seat control switch front height adjust up and down.</li> </ul>  <p>A0081763</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</b></li> </ul>	<p><b>Yes</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>C10</u> .</p>
<b>C10 CHECK FRONT HEIGHT MOTOR CIRCUIT 984 (YE/LB) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Control Switch C627.</li> <li>• Measure resistance between passenger seat control switch C627-7, circuit 984 (YE/LB), harness side and passenger power seat motor C3015-2, circuit 984 (YE/LB), harness side.</li> </ul>  <p>N0078871</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C11</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>C11 CHECK FRONT HEIGHT MOTOR CIRCUIT 985 (RD/LB) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between passenger seat control switch C627-1, circuit 985 (RD/LB), harness side and passenger front height motor C3015-3, circuit 985 (RD/LB), harness side.</li> </ul>  <p>N0078872</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <u>Seat Control Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>

### Pinpoint Test D: The Power Seat Does Not Recline - Driver

Refer to Wiring Diagrams Cell 120 , Power Seats for schematic and connector information.

**Normal Operation**

The seat control switch is supplied battery voltage on circuit 517 (BK/WH) and is supplied ground on circuit 57 (BK). When forward or rearward recliner positions are selected on the seat control switch, voltage and ground is applied to recliner motor circuits 918 (GY) and 919 (GY/BK) to move the seat backrest. When toggled in the opposite direction, the seat control switch reverses voltage polarity to the recliner motor and moves the seat backrest in the opposite direction.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Seat control switch
- Recliner assembly

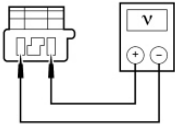
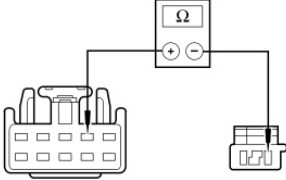
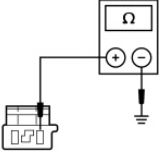
**PINPOINT TEST D: THE POWER SEAT DOES NOT RECLINE - DRIVER**

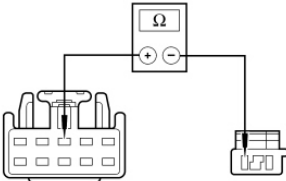
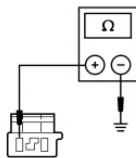
**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>D1 CHECK THE VOLTAGE TO THE RECLINER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u>.</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Driver Seat Recliner Motor C368.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u>.</li> <li>• Measure voltage between driver seat recliner motor C368-1, circuit 918 (GY), harness side and C368-2, circuit 919 (GY/BK), while pushing the recline switch forward and rearward.</li> </ul>	<p><b>Yes</b> INSTALL a new driver seat recliner motor. REFER to <u>Seat Recliner - Power</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS. REFER to <u>Section 501-20B</u>.</p> <p><b>No</b> GO to <u>D2</u>.</p>

 <p>N0052984</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</li> </ul>	
<b>D2 CHECK CIRCUIT 918 (GY) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Control Switch C519.</li> <li>• Measure resistance between seat backrest power recline motor C368-1, circuit 918 (GY), harness side and driver seat control switch C519-2, circuit 918 (GY), harness side.</li> </ul>  <p>N0078873</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>D3 CHECK CIRCUIT 918 (GY) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure resistance between seat backrest power recline motor C368-1, circuit 918 (GY), harness side and ground.</li> </ul>  <p>AR2031-A</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D4</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>D4 CHECK CIRCUIT 919 (GY/BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure resistance between seat backrest power recline motor C368-2, circuit 919 (GY/BK), harness side and driver seat control switch C519-3, circuit 919 (GY/BK), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>D5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

 <p>N007887-4</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<p><b>D5 CHECK CIRCUIT 919 (GY/BK) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Control Switch C519.</li> <li>• Measure resistance between seat backrest power recline motor C368-2, circuit 919 (GY/BK), harness side and ground.</li> </ul>  <p>AR2034-A</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new seat control switch. REFER to <a href="#">Seat Control Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

### Pinpoint Test E: The Power Seat Does Not Recline - Passenger

Refer to Wiring Diagrams Cell [120](#) , Power Seats for schematic and connector information.

#### Normal Operation

The seat control switch is supplied battery voltage on circuit 517 (BK/WH) and is supplied ground on circuit 57 (BK). When forward or rearward recliner positions are selected on the seat control switch, voltage and ground is applied to recliner motor circuits 918 (GY) and 919 (GY/BK) to move the seat backrest. When toggled in the opposite direction, the seat control switch reverses voltage polarity to the recliner motor and moves the seat backrest in the opposite direction.

#### This pinpoint test is intended to diagnose the following:

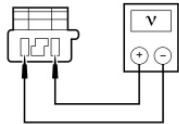
- Wiring, terminals or connectors
- Seat control switch
- Recliner assembly

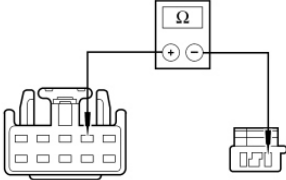
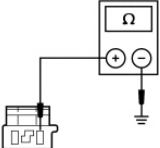
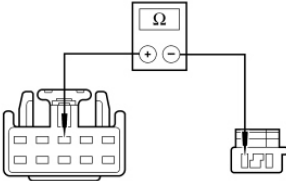
**PINPOINT TEST E: THE POWER SEAT DOES NOT RECLINE - PASSENGER**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

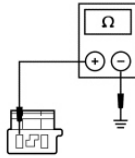
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>E1 CHECK THE VOLTAGE TO THE RECLINER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Seat Recliner Motor C338.</li> <li>• <b>⚠ WARNING:</b> Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</li> <li>• Connect the battery ground cable. Refer to <a href="#">Section 414-01</a>.</li> <li>• Measure voltage between passenger seat recliner motor C338-1, circuit 918 (GY), harness side and C338-2, circuit 919 (GY/BK), while pushing the recline switch forward and rearward.</li> </ul>  <p>N0052984</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts when the seat control switch is toggled in both directions and 0 volt in the rest position?</li> </ul>	<p><b>Yes</b>            INSTALL a new passenger seat recliner motor. REFER to <a href="#">Seat Recliner - Power</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a>.</p> <p><b>No</b>            GO to <a href="#">E2</a>.</p>
<b>E2 CHECK CIRCUIT 918 (GY) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Control Switch C627.</li> <li>• Measure resistance between seat backrest power recline motor C338-1, circuit 918 (GY), harness side and passenger seat control switch C627-2, circuit 918 (GY), harness side.</li> </ul>  <p>N0078873</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>E3 CHECK CIRCUIT 918 (GY) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between seat backrest power recline motor C338-1, circuit 918 (GY), harness side and ground.</li> </ul>  <p>AR2031-A</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>E4 CHECK CIRCUIT 919 (GY/BK) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between seat backrest power recline motor C338-2, circuit 919 (GY/BK), harness side and passenger seat control switch C627-3, circuit 919 (GY/BK), harness side.</li> </ul>  <p>N0078874</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>E5 CHECK CIRCUIT 919 (GY/BK) FOR A SHORT TO GROUND</b></p>	

- Disconnect: Passenger Seat Control Switch C627.
- Measure resistance between seat backrest power recline motor C338-2, circuit 919 (GY/BK), harness side and ground.



AR2034-A

- Is the resistance greater than 10,000 ohms?

**Yes**

INSTALL a new seat control switch. REFER to Seat Control Switch in this section. TEST the system for normal operation.

DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to Section 501-20B .

**No**

REPAIR the circuit. TEST the system for normal operation.

DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to Section 501-20B .

**Pinpoint Test F: The Power Seat Moves But is Noisy****Normal Operation**

The power seat should move quietly in the forward, rearward, front up/down and rear up/down directions during operation. Some noise is acceptable. Compare the noise to a similar vehicle for reference.

**This pinpoint test is intended to diagnose the following:**

- Seat track alignment
- Seat track obstruction
- Seat track

**PINPOINT TEST F: THE POWER SEAT MOVES BUT IS NOISY**

Test Step	Result / Action to Take
<b>F1 CHECK THE SEAT TRACK ALIGNMENT</b>	
<ul style="list-style-type: none"> <li>• Check alignment of the seat track to the floor and seat.</li> <li>• Is the track alignment OK?</li> </ul>	<p><b>Yes</b> GO to <u>F2</u> .</p> <p><b>No</b> ALIGN seat track to the floor and seat. TEST the system for normal operation.</p>



<b>F2 CHECK THE SEAT TRACK INTEGRITY</b>	
<ul style="list-style-type: none"> <li>While operating the seat, inspect the seat track for binding and damage.</li> <li><b>Is the seat track OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>F3</u> .</p> <p><b>No</b> INSTALL a new seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p>
<b>F3 CHECK THE SEAT MOTOR INTEGRITY</b>	
<ul style="list-style-type: none"> <li>While operating the seat, listen for excessive seat motor noise. Compare the noise to a similar vehicle for reference.</li> <li><b>Is the seat motor OK?</b></li> </ul>	<p><b>Yes</b> Allow the customer to compare to a similar vehicle to determine the amount of motor noise is product characteristic. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new front seat track. REFER to <u>Seat Track</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test G: The Power Seat Moves But is Loose****Normal Operation**

Power seat movement should be smooth and the seat cushion should not rock during or after operation.

**This pinpoint test is intended to diagnose the following:**

- Seat track fastening hardware
- Seat track

**PINPOINT TEST G: THE POWER SEAT MOVES BUT IS LOOSE**

Test Step	Result / Action to Take
<b>G1 CHECK THE SEAT MOUNTING FASTENERS</b>	
<ul style="list-style-type: none"> <li>Check for loose seat mounting fasteners and the condition of the seat track.</li> <li><b>Are the seat mounting fasteners tight and the seat track OK?</b></li> </ul>	<p><b>Yes</b> IDENTIFY the cause and REPAIR as necessary. TEST the system for normal operation.</p> <p><b>No</b> TIGHTEN all seat mounting fasteners to specification. TEST the system for normal operation.</p>

**Pinpoint Test H: The Power Seat Does Not Make Full Travel****Normal Operation**

The power seat should travel fully horizontal (forward/rearward) and vertical (front up/down and rear up/down).

**This pinpoint test is intended to diagnose the following:**

- Seat track obstruction
- Seat track

**PINPOINT TEST H: THE POWER SEAT DOES NOT MAKE FULL TRAVEL**

Test Step	Result / Action to Take
<b>H1 CHECK THE SEAT TRACK FOR AN OBSTRUCTION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Remove the seat and depower the Supplemental Restraint System (SRS). Refer to <u>Seat - Front</u> in this section.</li> <li>• Inspect the seat track components for any obstructions.</li> <li>• <b>Is the seat track clear of obstruction?</b></li> </ul>	<p><b>Yes</b> IDENTIFY the cause and REPAIR as necessary. TEST the system for normal operation.</p> <p>REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> REMOVE the obstruction(s) from the track(s). TEST the system for normal operation.</p> <p>REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>

**Pinpoint Test I: The Power Lumbar is Inoperative - Driver**

Refer to Wiring Diagrams Cell 122 , Power Lumbar Seats for schematic and connector information.

**Normal Operation**

The lumbar control switch is supplied battery voltage on circuit 517 (BK/WH). When the lumbar control switch is toggled in one direction, battery voltage is applied directly to a compressor in the seat backrest lumbar assembly from circuit 1094 (PK). The lumbar compressor is connected directly to ground circuit 57 (BK). When voltage is applied to the compressor motor from the lumbar control switch, air is pumped into the lumbar bladder expanding the backrest foam pad. Toggling the switch to the opposite position applies voltage to a solenoid valve coil in the compressor from circuit 1097 (BN) to release air from the lumbar bladder and the backrest foam pad relaxes.

**This pinpoint test is intended to diagnose the following:**

- Circuit breaker
- Wiring, terminals or connectors
- Lumbar control switch
- Lumbar assembly

**PINPOINT TEST I: THE POWER LUMBAR IS INOPERATIVE - DRIVER**

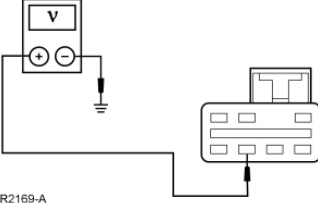
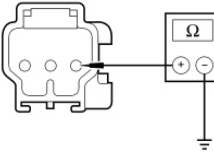
**⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to**

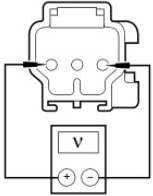
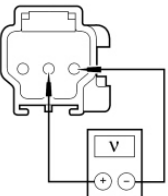
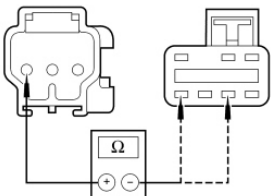
follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

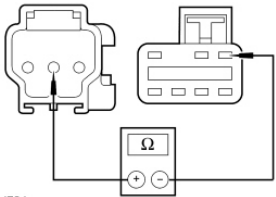
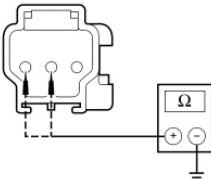
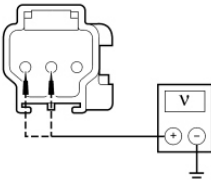
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>I1 CHECK THE LUMBAR COMPRESSOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the switch to inflate the lumbar.</li> <li>• <b>Does the lumbar compressor operate?</b></li> </ul>	<p><b>Yes</b> GO to <u>I2</u> .</p> <p><b>No</b> GO to <u>I3</u> .</p>
<b>I2 CHECK FOR AIRFLOW FROM THE LUMBAR COMPRESSOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect the air hose from the lumbar compressor fitting.</li> <li>• Operate the switch to inflate the lumbar and check for air from the compressor fitting.</li> <li>• <b>Is air blowing from the lumbar compressor fitting?</b></li> </ul>	<p><b>Yes</b> CHECK the hoses for leaks, disconnection or obstruction. REPAIR as necessary. If the hoses are OK, INSTALL a new lumbar assembly. REFER to <u>Lumbar Assembly</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the Supplemental Restraint System (SRS). REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> INSTALL a new lumbar assembly. REFER to <u>Lumbar Assembly</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>I3 CHECK CIRCUIT 517 (BK/WH) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Lumbar Control Switch C361.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Measure voltage between lumbar control switch C361-2, circuit 517 (BK/WH), harness side and ground.</li> </ul>  <p>AR2169-A</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> VERIFY the Battery Junction Box (BJB) circuit breaker 601 (20A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>I4 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Lumbar Motor C366.</li> <li>• Measure resistance between lumbar motor C366-3, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0044720</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>I5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>I5 CHECK THE VOLTAGE TO THE LUMBAR MOTOR</b>	

<ul style="list-style-type: none"> <li>• Connect: Lumbar Control Switch.</li> <li>• Measure voltage between lumbar motor C366-1, circuit 1094 (PK), harness side and C366-3, circuit 57 (BK), harness side while pressing the lumbar control switch inflate button.</li> </ul>  <p>A0044721</p> <ul style="list-style-type: none"> <li>• Measure voltage between lumbar motor C366-2, circuit 1097 (BN), harness side and C366-3, circuit 57 (BK), harness side while pressing the lumbar control switch deflate button.</li> </ul>  <p>A0044722</p> <p>• Are the voltages greater than 10 volts?</p>	<p><b>Yes</b> INSTALL a new lumbar assembly. REFER to <u>Lumbar Assembly</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>I6</u> .</p>
<p><b>I6 CHECK CIRCUITS 1094 (PK) AND 1097 (BN) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Lumbar Control Switch C361.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ lumbar control switch C361-1, circuit 1094 (PK), harness side and lumbar motor C366-1, circuit 1094 (PK), harness side.</li> <li>♦ lumbar control switch C361-3, circuit 1094 (PK), harness side and lumbar motor C366-1, circuit 1094 (PK), harness side.</li> </ul> </li> </ul>  <p>A0044723</p> <ul style="list-style-type: none"> <li>• Measure resistance between lumbar control switch C361-7, circuit 1097 (BN), harness side and lumbar motor C366-2, circuit 1097 (BN),</li> </ul>	<p><b>Yes</b> GO to <u>I7</u> .</p> <p><b>No</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>

<p>harness side.</p>  <p>A0044724</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<p><b>I7 CHECK CIRCUITS 1094 (PK) AND 1097 (BN) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ lumbar motor C366-1, circuit 1094 (PK), harness side and ground.</li> <li>♦ lumbar motor C366-2, circuit 1097 (BN), harness side and ground.</li> </ul> </li> </ul>  <p>A0044725</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>I8</u> .</p> <p><b>No</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>I8 CHECK CIRCUITS 1094 (PK) AND 1097 (BN) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure voltage between: <ul style="list-style-type: none"> <li>♦ lumbar motor C366-1, circuit 1094 (PK), harness side and ground.</li> <li>♦ lumbar motor C366-2, circuit 1097 (BN), harness side and ground.</li> </ul> </li> </ul>  <p>A0044726</p> <ul style="list-style-type: none"> <li>• Is voltage present on either circuit?</li> </ul>	<p><b>Yes</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> INSTALL a new lumbar control switch. REFER to <u>Lumbar Control Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the</p>

**Pinpoint Test J: The Power Lumbar is Inoperative - Passenger**

Refer to Wiring Diagrams Cell 122 , Power Lumbar Seats for schematic and connector information.

**Normal Operation**

The lumbar control switch is supplied battery voltage on circuit 517 (BK/WH). When the lumbar control switch is toggled in one direction, battery voltage is applied directly to a compressor in the seat backrest lumbar assembly from circuit 1094 (PK). The lumbar compressor is connected directly to ground circuit 57 (BK). When voltage is applied to the compressor motor from the lumbar control switch, air is pumped into the lumbar bladder expanding the backrest foam pad. Toggling the switch to the opposite position applies voltage to a solenoid valve coil in the compressor from circuit 1097 (BN) to release air from the lumbar bladder and the backrest foam pad relaxes.

**This pinpoint test is intended to diagnose the following:**

- Circuit breaker
- Wiring, terminals or connectors
- Lumbar control switch
- Lumbar assembly

**PINPOINT TEST J: THE POWER LUMBAR IS INOPERATIVE - PASSENGER**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

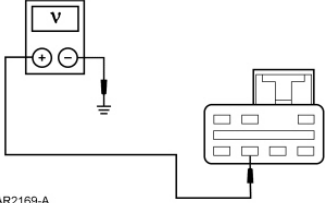
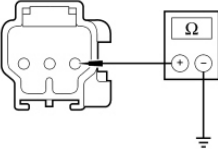
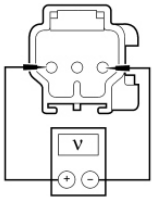
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

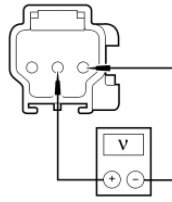
**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>J1 CHECK THE LUMBAR COMPRESSOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the switch to inflate the lumbar.</li> <li>• <b>Does the lumbar compressor operate?</b></li> </ul>	<b>Yes</b> GO to <u>J2</u> .  <b>No</b> GO to <u>J3</u> .
<b>J2 CHECK FOR AIRFLOW FROM THE LUMBAR COMPRESSOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect the air hose from the lumbar compressor fitting.</li> <li>• Operate the switch to inflate the lumbar and check for air from the compressor fitting.</li> </ul>	<b>Yes</b> CHECK the hoses for leaks, disconnection or obstruction. REPAIR as necessary. If the hoses are OK, INSTALL a new lumbar assembly. REFER to <u>Lumbar Assembly</u> in

<ul style="list-style-type: none"> <li>• <b>Is air blowing from the lumbar compressor fitting?</b></li> </ul>	<p>this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the Supplemental Restraint System (SRS). REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> INSTALL a new lumbar assembly. REFER to <u>Lumbar Assembly</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>J3 CHECK CIRCUIT 517 (BK/WH) FOR VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Lumbar Control Switch C331.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Measure voltage between lumbar control switch C331-2, circuit 517 (BK/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>J4</u> .</p> <p><b>No</b> VERIFY the Battery Junction Box (BJB) circuit breaker 601 (20A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>



 <p>AR2169-A</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<b>J4 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Lumbar Motor C336.</li> <li>• Measure resistance between lumbar motor C336-3, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0044720</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>J5 CHECK VOLTAGE TO THE LUMBAR MOTOR</b>	
<ul style="list-style-type: none"> <li>• Connect: Lumbar Control Switch.</li> <li>• Measure voltage between lumbar motor C336-1, circuit 1094 (PK), harness side and C336-3, circuit 57 (BK), harness side while pressing the lumbar control switch inflate button.</li> </ul>  <p>A0044721</p> <ul style="list-style-type: none"> <li>• Measure voltage between lumbar motor C336-2, circuit 1097 (BN), harness side and C336-3, circuit 57 (BK), harness side while pressing the lumbar control switch deflate button.</li> </ul>	<p><b>Yes</b> INSTALL a new lumbar assembly. REFER to <u>Lumbar Assembly</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>J6</u> .</p>

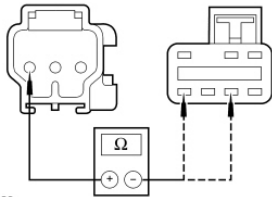


A0044722

- Are the voltages greater than 10 volts?

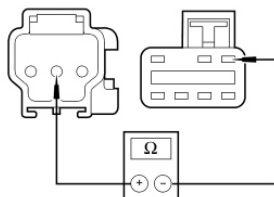
#### J6 CHECK CIRCUITS 1094 (PK) AND 1097 (BN) FOR AN OPEN

- Disconnect: Lumbar Control Switch C331.
- Measure resistance between:
  - ♦ lumbar control switch C331-1, circuit 1094 (PK), harness side and lumbar motor C336-1, circuit 1094 (PK), harness side.
  - ♦ lumbar control switch C331-3, circuit 1094 (PK), harness side and lumbar motor C336-1, circuit 1094 (PK), harness side.



A0044723

- Measure resistance between lumbar control switch C331-7, circuit 1097 (BN), harness side and lumbar motor C336-2, circuit 1097 (BN), harness side.



A0044724

- Are the resistances less than 5 ohms?

#### J7 CHECK CIRCUITS 1094 (PK) AND 1097 (BN) FOR A SHORT TO GROUND

- Measure resistance between:
  - ♦ lumbar motor C336-1, circuit 1094 (PK), harness side and ground.
  - ♦ lumbar motor C336-2, circuit 1097 (BN), harness side and ground.

**Yes**  
GO to J7 .

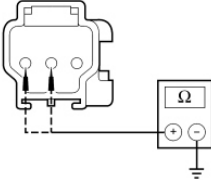
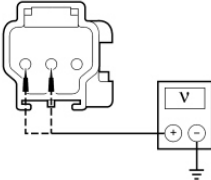
**No**  
REPAIR the circuit(s). TEST the system for normal operation.

DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to Section 501-20B .

**Yes**  
GO to J8 .

**No**  
REPAIR the circuit(s). TEST the system for normal operation.

DISCONNECT the battery ground cable.

 <p>A0044725</p> <p>• Are the resistances greater than 10,000 ohms?</p>	<p>DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<p><b>J8 CHECK CIRCUITS 1094 (PK) AND 1097 (BN) FOR A SHORT TO VOLTAGE</b></p>	
<p>• Ignition ON.</p> <p>• Measure voltage between:</p> <ul style="list-style-type: none"> <li>◆ lumbar motor C336-1, circuit 1094 (PK), harness side and ground.</li> <li>◆ lumbar motor C336-2, circuit 1097 (BN), harness side and ground.</li> </ul>  <p>A0044726</p> <p>• Is voltage present on either circuit?</p>	<p><b>Yes</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> INSTALL a new lumbar control switch. REFER to <a href="#">Lumbar Control Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

### Pinpoint Test K: The Heated Seat is Inoperative - Driver

Refer to Wiring Diagrams Cell [119](#) , Climate Controlled Seats for schematic and connector information.

#### Normal Operation

The heated seat module is supplied battery voltage and switched ignition voltage from circuits 1048 (LB/WH) and 1040 (RD/BK). The heated seat is activated when the heated seat switch supplies a ground signal to one of 2 input circuits into the heated seat module. Input circuit 1020 (DG/VT) activates the system to hi or off. Input circuit 1255 (WH/RD) activates the system to low or off. Once activated, the heated seat module supplies voltage and ground to heater mat circuits 1064 (YE/LB) and 1065 (WH/LB) to heat the seat cushion and backrest. The heated seat module monitors circuits 1060 (BK/LB) and 1061 (BN/LB) from the temperature sensor in the cushion heater mat to maintain the seat temperature. The system will remain on until the module times-out or is switched off.

#### This pinpoint test is intended to diagnose the following:

- Fuse(s)

- Wiring, terminals or connectors
- Heated seat switch
- Heater mat
- Heated seat module

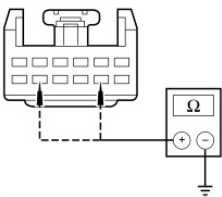
**PINPOINT TEST K: THE HEATED SEAT IS INOPERATIVE - DRIVER**

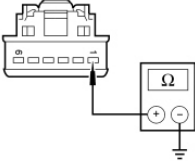
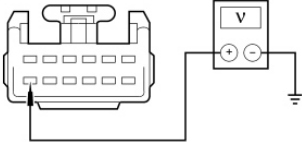
**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

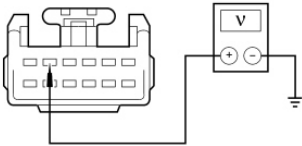
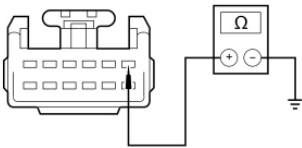
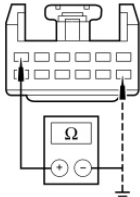
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

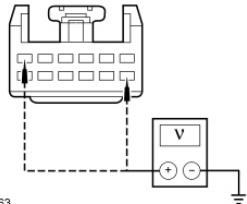
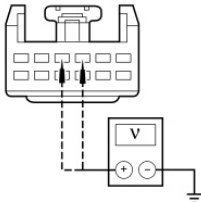
**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

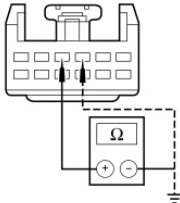
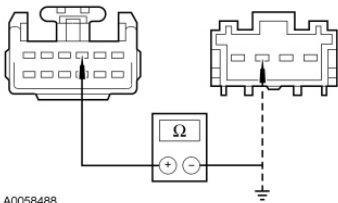
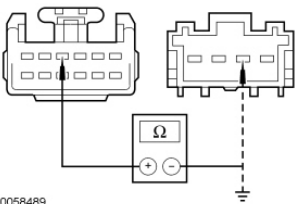
**NOTE:** If a driver seat heater mat (cushion or backrest) is faulty, a new foam pad must be installed with the new heater mat. Do not reuse the original foam pad.

Test Step	Result / Action to Take
<b>K1 CHECK HEATED SEAT SWITCH AND CIRCUIT RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Driver Heated Seat Module C359.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>◆ driver heated seat module C359-8, circuit 1020 (DG/VT), harness side and ground while pressing the heated seat switch.</li> <li>◆ driver heated seat module C359-11, circuit 1255 (WH/RD), harness side and ground while pressing the heated seat switch.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <a href="#">K3</a>.</p> <p><b>No</b> GO to <a href="#">K2</a>.</p>
 <p>A0049205</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 50 ohms when the heated seat switch is pressed and greater than</b></li> </ul>	

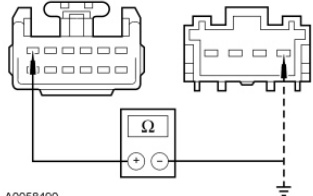
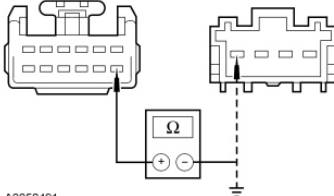
<p><b>10,000 ohms when the heated seat switch is not pressed?</b></p>	
<p><b>K2 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Heated Seat Switch C538.</li> <li>• Measure resistance between driver heated seat switch C538-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0049206</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b>            INSTALL a new heated seat switch. REFER to <u>Heated Seat Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b>            REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>K3 CHECK CIRCUIT 1048 (LB/WH) FOR VOLTAGE TO THE HEATED SEAT MODULE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Measure voltage between driver heated seat module C359-12, circuit 1048 (LB/WH), harness side and ground.</li> </ul>  <p>A0042223</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b>            GO to <u>K4</u> .</p> <p><b>No</b>            VERIFY the Battery Junction Box (BJB) fuse 16 (20A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>K4 CHECK CIRCUIT 1040 (RD/BK) FOR VOLTAGE TO THE HEATED SEAT MODULE</b></p>	

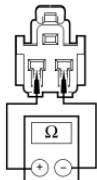
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure voltage between driver heated seat module C359-5, circuit 1040 (RD/BK), harness side and ground.</li> </ul>  <p>A0042224</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <b>K5</b> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 17 (10A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<b>K5 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure resistance between driver heated seat module C359-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0042225</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>K6</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<b>K6 CHECK HEATER CIRCUIT RESISTANCE AND FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-6, circuit 1064 (YE/LB), harness side and C359-7, circuit 1065 (WH/LB), harness side.</li> <li>♦ driver heated seat module C359-6, circuit 1064 (YE/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0050062</p> <ul style="list-style-type: none"> <li>• Is the resistance between 1.6 ohms and 10 ohms between C359-6 and C359-7 and greater than</li> </ul>	<p><b>Yes</b> GO to <b>K7</b> .</p> <p><b>No</b> GO to <b>K12</b> .</p>

<p><b>10,000 ohms between the C359-6 and ground?</b></p>	
<p><b>K7 CHECK HEATERS AND CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure voltage between: <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-6, circuit 1064 (YE/LB), harness side and ground.</li> <li>♦ driver heated seat module C359-7, circuit 1065 (WH/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0050063</p> <ul style="list-style-type: none"> <li>• Is voltage present on either circuit?</li> </ul>	<p><b>Yes</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">K8</a> .</p>
<p><b>K8 CHECK THE TEMPERATURE SENSOR AND CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Measure voltage between: <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-3, circuit 1061 (BN/LB), harness side and ground.</li> <li>♦ driver heated seat module C359-4, circuit 1060 (BK/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0050064</p> <ul style="list-style-type: none"> <li>• Is voltage present on either circuit?</li> </ul>	<p><b>Yes</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">K9</a> .</p>
<p><b>K9 CHECK THE TEMPERATURE SENSOR CIRCUITS RESISTANCE AND FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-3, circuit 1061 (BN/LB), harness side and C359-4, circuit 1060 (BK/LB), harness side.</li> <li>♦ driver heated seat module C359-3, circuit 1061 (BN/LB), harness side and ground.</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new driver heated seat module. REFER to <a href="#">Heated Seat Module</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

 <p>A0050065</p> <ul style="list-style-type: none"> <li>• Is the resistance between 50 ohms and 300,000 ohms between C359-3 and C359-4 and greater than 10,000 ohms between C359-3 and ground?</li> </ul>	<p><b>No</b> GO to <b>K10</b> .</p>
<p><b>K10 CHECK CIRCUIT 1061 (BN/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Cushion Heater C364.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-3, circuit 1061 (BN/LB), harness side and driver seat cushion heater C364-2, circuit 1061 (BN/LB), harness side.</li> <li>♦ driver heated seat module C359-3, circuit 1061 (BN/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058488</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> GO to <b>K11</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<p><b>K11 CHECK CIRCUIT 1060 (BK/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-4, circuit 1060 (BK/LB), harness side and driver seat cushion heater C364-3, circuit 1060 (BK/LB), harness side.</li> <li>♦ driver heated seat module C359-4, circuit 1060 (BK/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058489</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and</li> </ul>	<p><b>Yes</b> INSTALL a new driver seat cushion heater. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side</p>



<p><b>greater than 10,000 ohms between the heated seat module and ground?</b></p>	<p>air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>K12 CHECK CIRCUIT 1064 (YE/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Cushion Heater C364.</li> <li>• Measure resistance between:             <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-6, circuit 1064 (YE/LB), harness side and driver seat cushion heater C364-4, circuit 1064 (YE/LB), harness side.</li> <li>♦ driver heated seat module C359-6, circuit 1064 (YE/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058490</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> GO to <u>K13</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>K13 CHECK CIRCUIT 1065 (WH/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between:             <ul style="list-style-type: none"> <li>♦ driver heated seat module C359-7, circuit 1065 (WH/LB), harness side and driver seat cushion heater C364-1, circuit 1065 (WH/LB), harness side.</li> <li>♦ driver heated seat module C359-7, circuit 1065 (WH/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058491</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> GO to <u>K14</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>K14 CHECK THE SEAT BACK HEATER RESISTANCE</b></p>	

<ul style="list-style-type: none"> <li>• Disconnect: Driver Seat Back Heater C365.</li> <li>• Measure resistance between driver seat back heater C365 pin 1 and pin 2, component side.</li> </ul>  <p>A0048777</p> <ul style="list-style-type: none"> <li>• Is the resistance between 0.6 and 0.9 ohm?</li> </ul>	<p><b>Yes</b>          INSTALL a new driver seat cushion heater.          TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable.          DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b>          INSTALL a new driver seat back heater.          TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable.          DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
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### Pinpoint Test L: The Heated Seat is Inoperative - Passenger

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

#### Normal Operation

The heated seat module is supplied battery voltage and switched ignition voltage on circuits 1048 (LB/WH) and 1040 (RD/BK). The heated seat is activated when the heated seat switch supplies a ground signal to one of 2 input circuits into the heated seat module. Input circuits 581 (RD) and 1020 (DG/VT) activate the system hi or off. Input circuits 1256 (WH/YE) and 1255 (WH/RD) activate the system to low or off. Once activated, the heated seat module supplies voltage and ground to the heater mat circuits 1064 (YE/LB) and 1065 (WH/LB) to heat the seat cushion and backrest. The heated seat module monitors circuits 1060 (BK/LB) and 1061 (BN/LB) from the temperature sensor in the cushion heater mat to maintain the seat temperature. The system will remain on until the module times-out or is switched off.

#### This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- Heated seat switch
- Heater mat
- Heated seat module

### PINPOINT TEST L: THE HEATED SEAT IS INOPERATIVE - PASSENGER

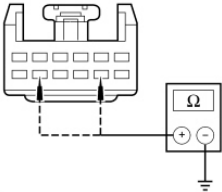
**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

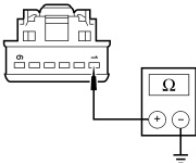
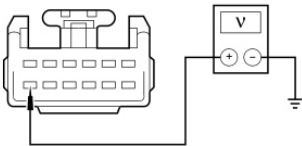
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

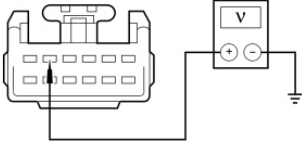
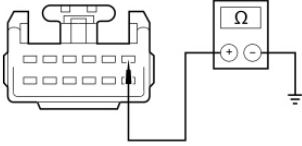
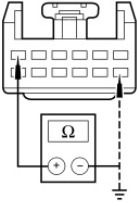
**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

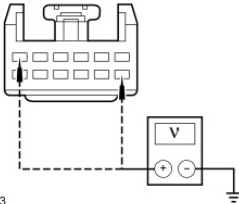
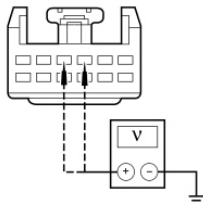
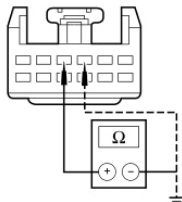
**NOTE:** The heater mat on the front passenger seat cushion is not serviceable separately. If a new heater mat is needed on the front passenger seat cushion, a new Occupant Classification Sensor (OCS) system service kit and a new heater mat must be installed. Refer to Section 501-20B.

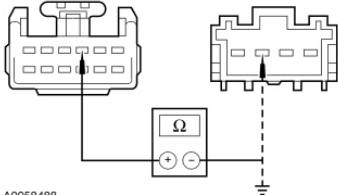
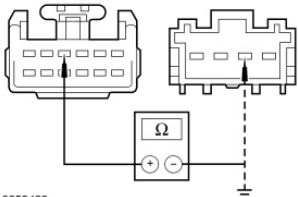
**NOTE:** If a passenger seat backrest heater mat is faulty, a new foam pad must be installed with the new heater mat. Do not reuse the original foam pad.

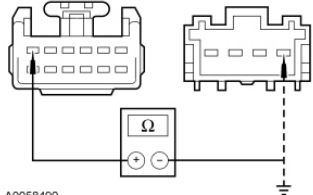
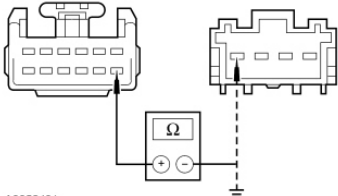
Test Step	Result / Action to Take
<b>L1 CHECK THE HEATED SEAT SWITCH AND CIRCUIT RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u>.</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Heated Seat Module C329.</li> <li>• Measure resistance between passenger heated seat module C329-8, circuit 581 (RD), and C329-11, circuit 1256 (WH/YE), harness side and ground while pressing the heated seat switch.</li> </ul>  <p>A0049205</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms when the heated seat switch is pressed?</li> </ul>	<p><b>Yes</b> GO to <u>L3</u>.</p> <p><b>No</b> GO to <u>L2</u>.</p>
<b>L2 CHECK THE HEATED SEAT SWITCH GROUND CIRCUIT 57 (BK)</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Heated Seat Switch C630.</li> <li>• Measure resistance between passenger heated seat switch C630-1, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new heated seat switch. REFER to <u>Heated Seat Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module</p>

 <p>A0049206</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p>C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<b>L3 CHECK CIRCUIT 1048 (LB/WH) FOR VOLTAGE TO THE HEATED SEAT MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <a href="#">Section 414-01</a> .</li> <li>• Measure voltage between passenger heated seat module C329-12, circuit 1048 (LB/WH), harness side and ground.</li> </ul>  <p>A0042223</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">L4</a> .</p> <p><b>No</b> VERIFY the Battery Junction Box (BJB) fuse 16 (20A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
<b>L4 CHECK CIRCUIT 1040 (RD/BK) FOR VOLTAGE TO THE HEATED SEAT MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure voltage between passenger heated seat module C329-5, circuit 1040 (RD/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <a href="#">L5</a> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 17 (10A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>

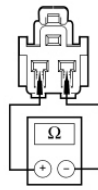
 <p>A0042224</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>L5 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure resistance between passenger heated seat module C329-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0042225</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>L6</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<b>L6 CHECK THE HEATER CIRCUIT RESISTANCE AND FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure resistance between:           <ul style="list-style-type: none"> <li>♦ passenger heated seat module C329-6, circuit 1064 (YE/LB), harness side and C329-7, circuit 1065 (WH/LB), harness side.</li> <li>♦ passenger heated seat module C329-6, circuit 1064 (YE/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0050062</p> <ul style="list-style-type: none"> <li>• Is the resistance between 1.6 ohms and 10 ohms between C329-6 and C329-7 and greater than 10,000 ohms between C329-6 and ground?</li> </ul>	<p><b>Yes</b> GO to <u>L7</u> .</p> <p><b>No</b> GO to <u>L12</u> .</p>
<b>L7 CHECK THE HEATERS AND CIRCUITS FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure voltage between:           <ul style="list-style-type: none"> <li>♦ passenger heated seat module C329-6, circuit 1064 (YE/LB), harness side and ground.</li> </ul> </li> </ul>	<p><b>Yes</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint</p>

<p>♦ passenger heated seat module C329-7, circuit 1065 (WH/LB), harness side and ground.</p>  <p>A0050063</p> <p>• Is voltage present on either circuit?</p>	<p>system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">L8</a> .</p>
<p><b>L8 CHECK TEMPERATURE SENSOR AND CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	
<p>• Measure voltage between:</p> <p>♦ passenger heated seat module C329-3, circuit 1061 (BN/LB), harness side and ground.</p> <p>♦ passenger heated seat module C329-4, circuit 1060 (BK/LB), harness side and ground.</p>  <p>A0050064</p> <p>• Is voltage present on either circuit?</p>	<p><b>Yes</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">L9</a> .</p>
<p><b>L9 CHECK TEMPERATURE SENSOR CIRCUITS RESISTANCE AND FOR A SHORT TO GROUND</b></p>	
<p>• Ignition OFF.</p> <p>• Measure resistance between:</p> <p>♦ passenger heated seat module C329-3, circuit 1061 (BN/LB), harness side and C329-4, circuit 1060 (BK/LB), harness side.</p> <p>♦ passenger heated seat module C329-3, circuit 1061 (BN/LB), harness side and ground.</p>  <p>A0050065</p> <p>• Is the resistance between 50 ohms and 300,000 ohms between C329-3 and C329-4 and greater than 10,000 ohms between C329-3 and ground?</p>	<p><b>Yes</b> INSTALL a new passenger heated seat module. REFER to <a href="#">Heated Seat Module</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">L10</a> .</p>
<p><b>L10 CHECK CIRCUIT 1061 (BN/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	

<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Cushion Heater C334.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ passenger heated seat module C329-3, circuit 1061 (BN/LB), harness side and passenger seat cushion heater C334-2, circuit 1061 (BN/LB), harness side.</li> <li>♦ passenger heated seat module C329-3, circuit 1061 (BN/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058488</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> GO to <u>L11</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>L11 CHECK CIRCUIT 1060 (BK/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ passenger heated seat module C329-4, circuit 1060 (BK/LB), harness side and passenger seat cushion heater C334-3, circuit 1060 (BK/LB), harness side.</li> <li>♦ passenger heated seat module C329-4, circuit 1060 (BK/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058489</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> INSTALL a new passenger seat cushion heater. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>
<p><b>L12 CHECK CIRCUIT 1064 (YE/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	

<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Cushion Heater C334.</li> <li>• Measure resistance between:             <ul style="list-style-type: none"> <li>♦ passenger heated seat module C329-6, circuit 1064 (YE/LB), harness side and passenger seat cushion heater C334-4, circuit 1064 (YE/LB), harness side.</li> <li>♦ passenger heated seat module C329-6, circuit 1064 (YE/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058490</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> GO to <b>L13</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<p><b>L13 CHECK CIRCUIT 1065 (WH/LB) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure resistance between:             <ul style="list-style-type: none"> <li>♦ passenger heated seat module C329-7, circuit 1065 (WH/LB), harness side and passenger seat cushion heater C334-1, circuit 1065 (WH/LB), harness side.</li> <li>♦ passenger heated seat module C329-7, circuit 1065 (WH/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0058491</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat module and seat cushion heater and greater than 10,000 ohms between the heated seat module and ground?</li> </ul>	<p><b>Yes</b> GO to <b>L14</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <b>Section 501-20B</b> .</p>
<p><b>L14 CHECK THE SEAT BACK HEATER RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Back Heater C335.</li> <li>• Measure resistance between passenger seat back heater C335 pin 1 and pin 2, component side.</li> </ul>	<p><b>Yes</b> INSTALL a new passenger seat cushion heater. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316.</p>





A0048777

- Is the resistance between 0.6 and 0.9 ohm?

REPOWER the SRS . REFER to Section 501-20B .

**No**

INSTALL a new passenger seat back heater. TEST the system for normal operation.

DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316.

REPOWER the SRS . REFER to Section 501-20B .

### Pinpoint Test M: The Heated Seat is Inoperative - Driver, Does Not Operate in High

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

#### Normal Operation

The heated seat is activated when the heated seat switch sends a ground signal to the heated seat module input from circuit 1020 (DG/VT) to activate hi heat or off. The system will remain on until the module times-out or is switched off.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Heated seat switch
- Heated seat module

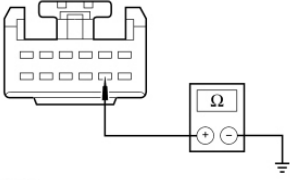
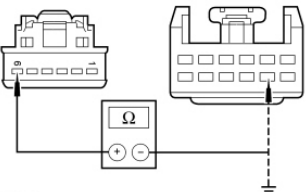
#### PINPOINT TEST M: THE HEATED SEAT IS INOPERATIVE - DRIVER, DOES NOT OPERATE IN HIGH

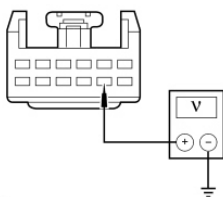
**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>M1 CHECK THE HEATED SEAT SWITCH AND CIRCUIT RESISTANCE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Driver Heated Seat Module C359.</li> <li>• Measure resistance between driver heated seat module C359-8, circuit 1020 (DG/VT), harness side and ground while pressing the heated seat switch.</li> </ul>  <p>A0042472</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 50 ohms with the heated seat switch pressed and greater than 10,000 ohms with the heated seat switch at rest?</b></li> </ul>	<p><b>Yes</b>          INSTALL a new heated seat module. REFER to <a href="#">Heated Seat Module</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS. REFER to <a href="#">Section 501-20B</a>.</p> <p><b>No</b>          GO to <a href="#">M2</a>.</p>
<p><b>M2 CHECK CIRCUIT 1020 (DG/VT) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Heated Seat Switch C538.</li> <li>• Measure resistance between:             <ul style="list-style-type: none"> <li>◆ driver heated seat switch C538-6, circuit 1020 (DG/VT), harness side and driver heated seat module C359-8, circuit 1020 (DG/VT), harness side.</li> <li>◆ driver heated seat switch C538-6, circuit 1020 (DG/VT), harness side and ground.</li> </ul> </li> </ul>  <p>A0049209</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms between the heated seat switch and heated seat module and greater than 10,000 ohms between the heated seat switch and ground?</b></li> </ul>	<p><b>Yes</b>          GO to <a href="#">M3</a>.</p> <p><b>No</b>          REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS. REFER to <a href="#">Section 501-20B</a>.</p>
<p><b>M3 CHECK CIRCUIT 1020 (DG/VT) FOR A SHORT TO VOLTAGE</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <a href="#">Section 414-01</a> .</li> <li>• Ignition ON.</li> <li>• Measure voltage between the driver heated seat module C359-8, circuit 1020 (DG/VT), harness side and ground.</li> </ul>  <p>A0049210</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> INSTALL a new heated seat switch. REFER to <a href="#">Heated Seat Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>
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### Pinpoint Test N: The Heated Seat is Inoperative - Driver, Does Not Operate in Low

Refer to Wiring Diagrams Cell [119](#) , Climate Controlled Seats for schematic and connector information.

#### Normal Operation

The heated seat is activated when the heated seat switch sends a ground signal to the heated seat module input from circuit 1255 (WH/RD) to activate low heat or off. The system will remain on until the module times-out or is switched off.

#### This pinpoint test is intended to diagnose the following:

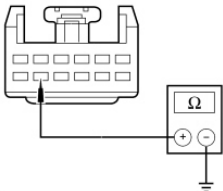
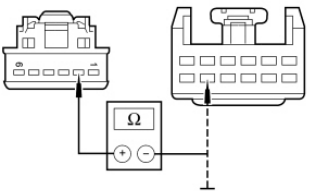
- Wiring, terminals or connectors
- Heated seat switch
- Heated seat module

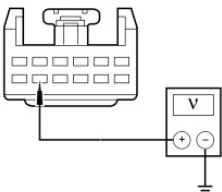
### PINPOINT TEST N: THE HEATED SEAT IS INOPERATIVE - DRIVER, DOES NOT OPERATE IN LOW

**⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.**

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<p><b>N1 CHECK THE HEATED SEAT SWITCH AND CIRCUIT RESISTANCE</b></p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <a href="#">Section 501-20B</a> .</li> <li>• Disconnect: Driver Seat Side Air Bag C315.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Driver Seat Side Air Bag C315.</li> <li>• Disconnect: Driver Heated Seat Module C359.</li> <li>• Measure resistance between driver heated seat module C359-11, circuit 1255 (WH/RD), harness side and ground while pressing the heated seat switch.</li> </ul>  <p>A0049211</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 50 ohms with the heated seat switch pressed and greater than 10,000 ohms with the heated seat switch at rest?</b></li> </ul>	<p><b>Yes</b> INSTALL a new heated seat module. REFER to <a href="#">Heated Seat Module</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">N2</a> .</p>
<p><b>N2 CHECK CIRCUIT 1255 (WH/RD) FOR AN OPEN OR SHORT TO GROUND</b></p> <ul style="list-style-type: none"> <li>• Disconnect: Driver Heated Seat Switch C538.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>◆ driver heated seat switch C538-2, circuit 1255 (WH/RD), harness side and driver heated seat module C359-11, circuit 1255 (WH/RD), harness side.</li> <li>◆ driver heated seat switch C538-2, circuit 1255 (WH/RD), harness side and ground.</li> </ul> </li> </ul>  <p>A0049212</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms between the heated seat switch and heated seat module and greater than 10,000 ohms between the heated seat switch and ground?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">N3</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

N3 CHECK CIRCUIT 1255 (WH/RD) FOR A SHORT TO VOLTAGE	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <a href="#">Section 414-01</a>.</li> <li>• Ignition ON.</li> <li>• Measure voltage between driver heated seat module C359-11, circuit 1255 (WH/RD), harness side and ground.</li> </ul>  <p>A0049213</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> INSTALL a new heated seat switch. REFER to <a href="#">Heated Seat Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from driver seat side air bag module C315. CONNECT driver seat side air bag module C315. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

### Pinpoint Test O: The Heated Seat is Inoperative - Passenger, Does Not Operate in High

Refer to Wiring Diagrams Cell [119](#) , Climate Controlled Seats for schematic and connector information.

#### Normal Operation

The heated seat is activated when the heated seat switch sends a ground signal to the heated seat module input from circuits 581 (RD) and 1020 (DG/VT) to activate hi heat or off. The system will remain on until the module times-out or is switched off.

#### This pinpoint test is intended to diagnose the following:

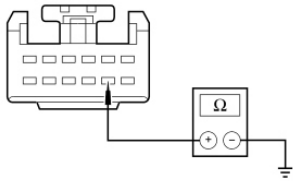
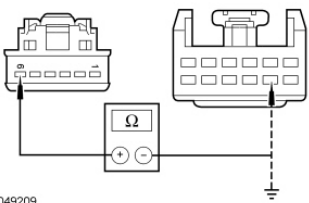
- Wiring, terminals or connectors
- Heated seat switch
- Heated seat module

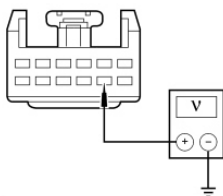
### PINPOINT TEST O: THE HEATED SEAT IS INOPERATIVE - PASSENGER, DOES NOT OPERATE IN HIGH

**⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.**

**NOTICE: Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>O1 CHECK HEATED SEAT SWITCH AND CIRCUIT RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <a href="#">Section 501-20B</a> .</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Heated Seat Module C329.</li> <li>• Measure resistance between passenger heated seat module C329-8, circuit 581 (RD), harness side and ground while pressing the heated seat switch.</li> </ul>  <p>A0042472</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 50 ohms with the heated seat switch pressed and greater than 10,000 ohms with the heated seat switch at rest?</b></li> </ul>	<p><b>Yes</b> INSTALL a new heated seat module. REFER to <a href="#">Heated Seat Module</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> GO to <a href="#">O2</a> .</p>
<b>O2 CHECK CIRCUITS 581 (RD) AND 1020 (DG/VT) FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Heated Seat Switch C630.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ passenger heated seat switch C630-6, circuit 1020 (DG/VT), harness side and passenger heated seat module C329-8, circuit 581 (RD), harness side.</li> <li>♦ passenger heated seat switch C630-6, circuit 1020 (DG/VT), harness side and ground.</li> </ul> </li> </ul>  <p>A0049209</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms between the heated seat switch and heated seat module and greater than 10,000 ohms between the heated seat switch and</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">O3</a> .</p> <p><b>No</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

ground?	
<b>O3 CHECK CIRCUIT 581 (RD) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <u>Section 414-01</u> .</li> <li>• Ignition ON.</li> <li>• Measure voltage between passenger heated seat module C329-8, circuit 581 (RD), harness side and ground.</li> </ul> <div>  </div> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> INSTALL a new heated seat switch. REFER to <u>Heated Seat Switch</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>

**Pinpoint Test P: The Heated Seat is Inoperative - Passenger, Does Not Operate in Low**

Refer to Wiring Diagrams Cell 119 , Climate Controlled Seats for schematic and connector information.

**Normal Operation**

The heated seat is activated when the heated seat switch sends a ground signal to the heated seat module input from circuits 1256 (WH/YE) and 1255 (WH/RD) to activate low heat or off. The system will remain on until the module times-out or is switched off.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Heated seat switch
- Heated seat module

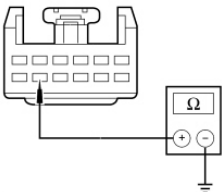
**PINPOINT TEST P: THE HEATED SEAT IS INOPERATIVE - PASSENGER, DOES NOT OPERATE IN LOW**

**⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate**

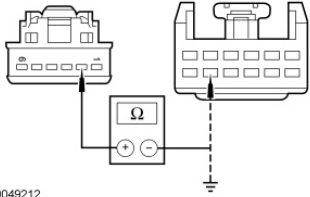
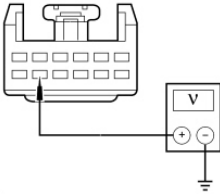
vehicle safety standards.

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

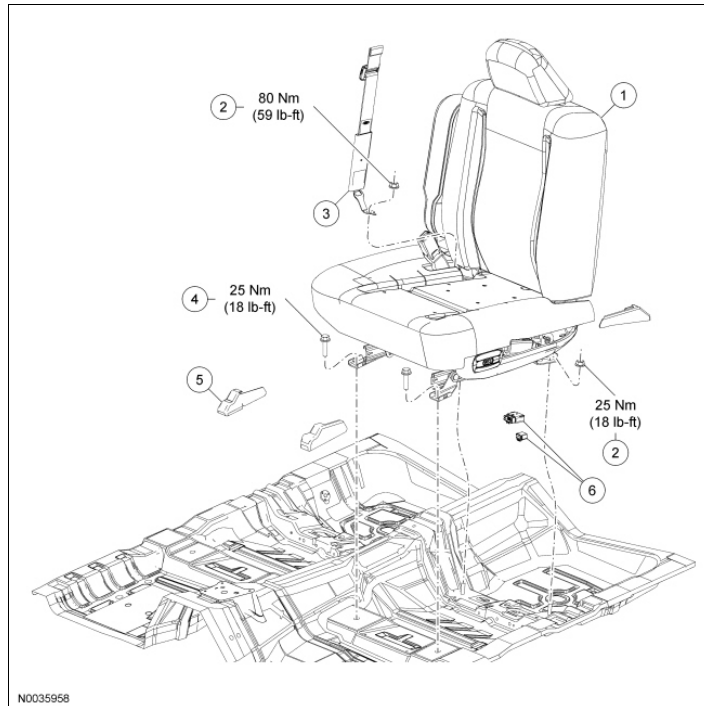
**NOTICE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>P1 CHECK THE HEATED SEAT SWITCH AND CIRCUIT RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the Supplemental Restraint System (SRS). Refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of <u>Section 501-20B</u> .</li> <li>• Disconnect: Passenger Seat Side Air Bag C316.</li> <li>• Connect: Restraint System Diagnostic Service Tool to Passenger Seat Side Air Bag C316.</li> <li>• Disconnect: Passenger Heated Seat Module C329.</li> <li>• Measure resistance between passenger heated seat module C329-11, circuit 1256 (WH/YE), harness side and ground while pressing the heated seat switch.</li> </ul>  <p>A0049211</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 50 ohms with the heated seat switch pressed and greater than 10,000 ohms with the heated seat switch at rest?</li> </ul>	<p><b>Yes</b> INSTALL a new heated seat module. REFER to <u>Heated Seat Module</u> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>P2</u> .</p>
<b>P2 CHECK CIRCUITS 1256 (WH/YE) AND 1255 (WH/RD) FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Heated Seat Switch C630.</li> <li>• Measure resistance between: <ul style="list-style-type: none"> <li>♦ passenger heated seat switch C630-2, circuit 1255 (WH/RD), harness side and passenger heated seat module C329-11, circuit 1256 (WH/YE), harness side.</li> <li>♦ passenger heated seat switch C630-2, circuit 1255 (WH/RD), harness side and ground.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>P3</u> .</p> <p><b>No</b> REPAIR the circuit(s). TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <u>Section 501-20B</u> .</p>



 <p>A0049212</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the heated seat switch and heated seat module and greater than 10,000 ohms between the heated seat switch and ground?</li> </ul>	
<b>P3 CHECK CIRCUIT 1256 (WH/YE) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Connect the battery ground cable. Refer to <a href="#">Section 414-01</a> .</li> <li>• Ignition ON.</li> <li>• Measure voltage between passenger heated seat module C329-11, circuit 1256 (WH/YE), harness side and ground.</li> </ul>  <p>A0049213</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> INSTALL a new heated seat switch. REFER to <a href="#">Heated Seat Switch</a> in this section. TEST the system for normal operation.</p> <p>DISCONNECT the battery ground cable. DISCONNECT the restraint system diagnostic service tool from passenger seat side air bag module C316. CONNECT passenger seat side air bag module C316. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> .</p>



**Seat - Front****NOTE:** Driver seat shown, passenger similar.

Item	Part Number	Description
1	-	Front seat
2	N621945/ N621940	Seat track-to-floor nuts (inboard/outboard)
3	611B76/611B70	Center safety belt and tongue/safety belt and buckle
4	N807000	Seat track-to-floor bolt (2 required)
5	61748/61749	Seat track cover (inboard/outboard) (4 required)
6	-	Electrical connectors (part of 14A699)

**Removal**

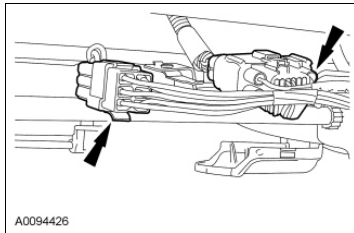
**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition switch is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Position the seat to allow access to the front and rear retainers.
2. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .

3. Remove the 2 rear front seat track covers.
4. Remove the 2 seat-to-floor nuts.
5. Remove the 2 seat track front covers.
6. Remove the 2 seat-to-floor bolts.
7. Disconnect the electrical connectors and detach the wiring harness pin-type retainer from the seat track.



8. **NOTICE:** Use care when handling the seat and track assembly. Dropping the assembly or sitting on a seat not secured in the vehicle may result in damaged components.

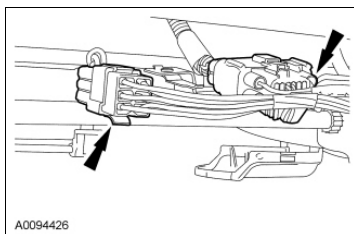
Remove the seat from the vehicle.

## Installation

1. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

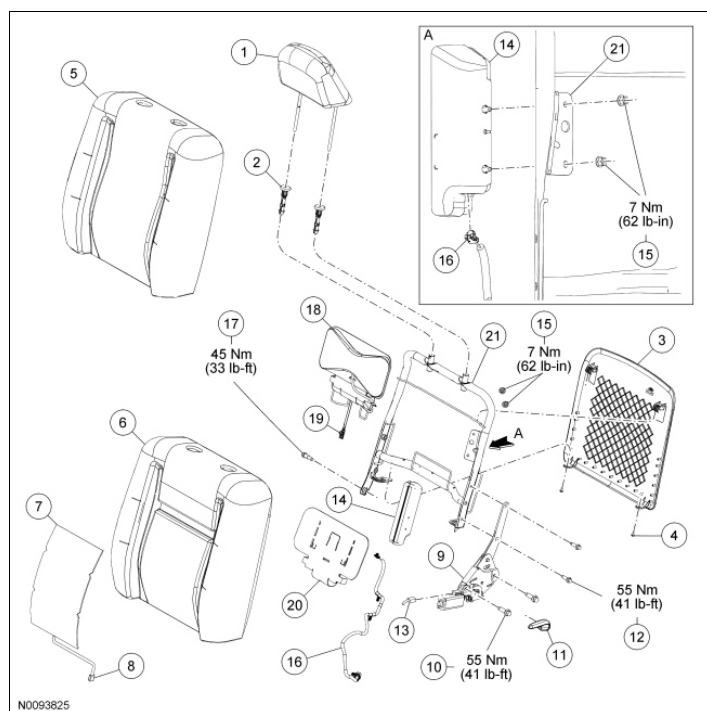
Position the seat in the vehicle and safety belt anchor to the seat mounting stud.

2. Connect the electrical connectors and attach the wiring harness pin-type retainer to the seat track.



3. Install the inboard seat-to-floor nut.
  - Before installing the inboard seat-to-floor nut, make sure the center seat safety belt buckle anchor is correctly positioned to the seat track and seat mounting stud.
  - Tighten to 80 Nm (59 lb-ft).
4. Install the outboard seat-to-floor nut.
  - Tighten to 25 Nm (18 lb-ft).
5. Install the 2 rear front seat track covers.
6. Install the 2 seat-to-floor bolts.
  - Tighten to 25 Nm (18 lb-ft).
7. Install the 2 seat track front covers.

8. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .
-

**Seat - Exploded View, Front****Front Seat Backrest****NOTE:** Driver seat shown, passenger similar.**NOTE:** Fifty percent seat shown, 40 percent similar.

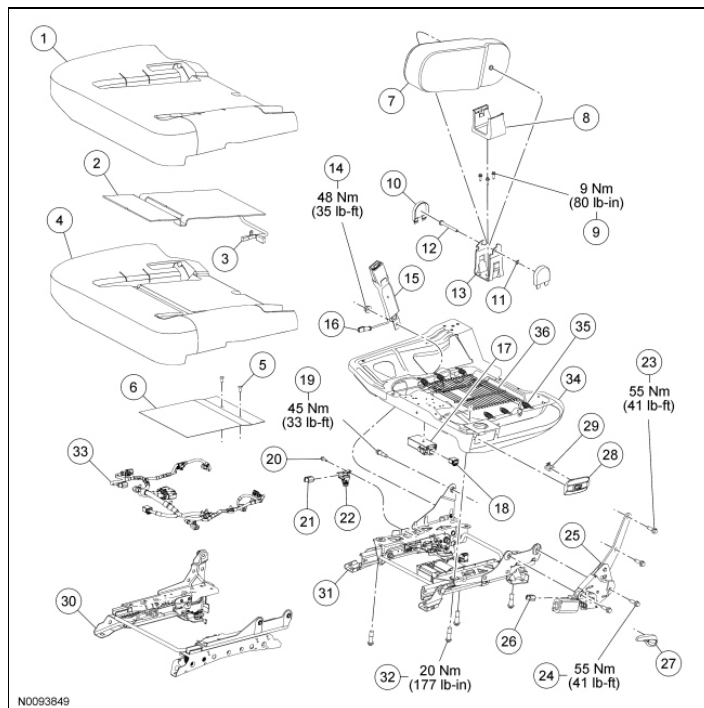
Item	Part Number	Description
1	611A08	Head restraint assembly
2	610A18	Head restraint guide (2 required)
3	60770	Seat back trim panel (police only)
4	-	Seat back trim panel screw (2 required, police only)
5	64416	Backrest trim cover
6	64810	Backrest foam pad
7	14D696	Backrest heater mat (if equipped)
8	-	Electrical connector (if equipped, part of 14D696)
9	62648 RH/ 62649 LH	Recliner assembly (power shown, if equipped)
10	N803463	Recliner-to-seat track bolt (2 required)
11	61198	Recliner handle
12	N803463	Recliner-to-backrest frame bolt (2 required)
13	-	Electrical connector (if equipped)

14	611D10	Side air bag module (if equipped)
15	N620480	Side air bag module nuts (2 required, if equipped)
16	14716	Side air bag module wiring harness (if equipped)
17	N808123	Pivot bolt
18	65500	Lumbar assembly, power (if equipped)
19	-	Electrical connector (if equipped)
20	-	Lumbar support
21	61018	Backrest frame

### Driver cushion

**NOTE:** Driver seat shown. For disassembly and assembly of the passenger seat cushion, refer to Occupant Classification Sensor procedure in [Section 501-20B](#) .

**NOTE:** Front 50 percent seat shown, 40 percent similar.



Item	Part Number	Description
1	62900	Cushion trim cover
2	14D696	Cushion heater mat (if equipped)
3	-	Electrical connector (if equipped, part of 14D696)
4	632A22	Cushion foam pad
5	-	Pushpin
6	-	Mat
7	65478/644A18	Armrest pad/cover (if equipped)

8	672A32	Armrest cover trim (if equipped)
9	N611624	Armrest bracket bolt (3 required, if equipped)
10	672A28	Pin cover (2 required, if equipped)
11	W623464	Retaining clip (if equipped)
12	65476	Pin (if equipped)
13	63076	Armrest bracket (if equipped)
14	-	Nut, safety belt buckle
15	61202 RH/ 61203 LH	Safety belt buckle
16	-	Electrical connector
17	14C724	Heated seat module (if equipped)
18	-	Electrical connector
19	N808123	Pivot bolt
20	-	Bolt, seat position sensor (driver only)
21	-	Electrical connector (driver only)
22	-	Seat position sensor (driver only)
23	N803463	Recliner-to-backrest bolt (2 required)
24	N803463	Recliner-to-seat track bolt (2 required)
25	62648 RH/ 62649 LH	Recliner, power (if equipped)
26	-	Electrical connector (part of 14A699, if equipped)
27	61198	Recliner handle, manual
28	-	Lumbar control switch
29	-	Electrical connector
30	61704 RH/ 61705 LH	Manual seat track
31	61710	Power seat track
32	N802906	Seat track-to-cushion frame bolt (4 required)
33	14A699	Seat wiring harness
34	63100	Cushion frame
35	603A06	Cushion support spring (6 required)
36	63226	Seat cushion support

1. For additional information, refer to the procedures in this section.





**Seat Backrest - Front****Removal**

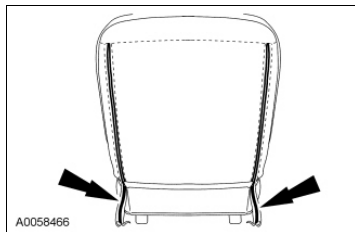
**NOTE:** Note all wire harness routing for correct installation.

**All vehicles**

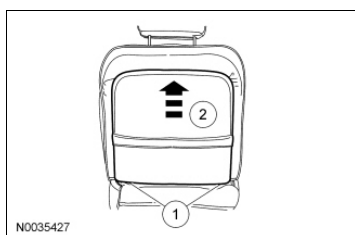
1. Position the seat all the way forward and up.
2. Depower the Supplemental Restraint System (SRS). For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B.

**Police vehicles**

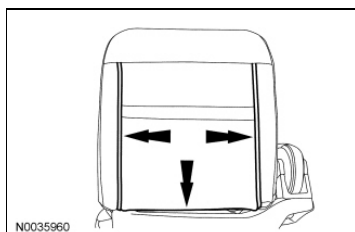
3. Pull the zippers out from underneath the material, unzip both zippers and position the backrest trim cover up to access the backrest trim panel.



4. Remove the backrest trim panel.
  1. Remove the 2 screws located at the bottom of the backrest trim panel.
  2. Pull out at the bottom and slide the backrest trim panel up to disengage the 2 upper retaining hooks.

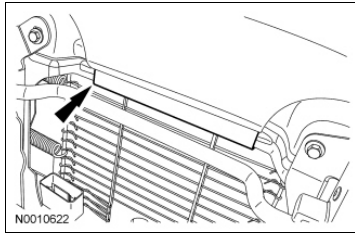
**Non-police vehicles**

5. Release the backrest trim cover J-clips.
  - Release the lower J-clip first and then release the 2 side J-clips.



### Vehicles with power lumbar

6. Release the cushion trim cover rear J-clip.



7. Release the cushion trim cover rear corner J-clip.
8. Disconnect the power lumbar electrical connector.

### All vehicles

9. If equipped, disconnect the backrest heated seat electrical connector.
10. Disconnect the seat side air bag module electrical connector and route it through the seat cushion.
11. Remove the recliner-to-backrest bolts.
12. Remove the pivot bolt.
13. Remove the seat backrest.
  - Route out any wire harness(es) that passes through the seat cushion.

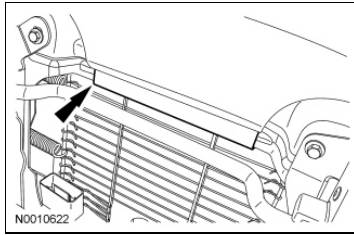
### Installation

#### All vehicles

1. Position the seat backrest.
  - Route any wire harness(es) back through the seat cushion as noted during removal.
2. Install the pivot bolt.
  - Tighten to 45 Nm (33 lb-ft).
3. Install the recliner-to-backrest bolts.
  - Tighten to 55 Nm (41 lb-ft).
4. Connect and attach the seat side air bag electrical connector.
5. If equipped, connect the backrest heated seat electrical connector.

### Vehicles with power lumbar

6. Connect the power lumbar electrical connector.
7. Attach the cushion trim cover rear corner J-clip.
8. Attach the cushion trim cover rear J-clip.

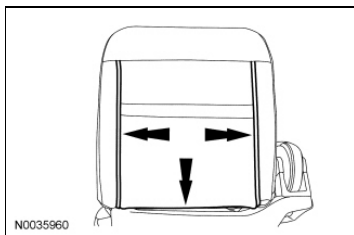


### Non-police vehicles

9. **NOTE:** Note the alignment of the 2 side J-clips at the top of the seat to avoid bunching.

Attach the backrest trim cover J-clips.

- Attach the 2 side J-clips first and then attach the lower J-clip.

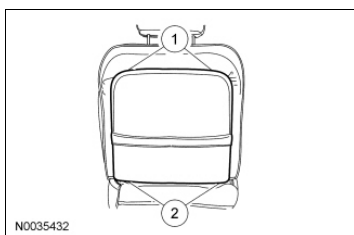


### Police vehicles

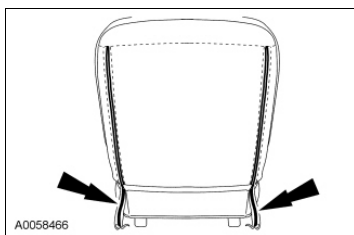
10. **NOTICE:** Inspect the seat backrest trim panel retaining hooks for damage. If damaged, install a new seat backrest trim panel.

Install the backrest trim panel.

1. Angle the top of the seat backrest trim panel inward and down to engage the 2 upper retaining hooks to the backrest frame.
2. Push in on the lower backrest trim panel and install the 2 screws.



11. Pull the seat backrest material down, zip both zippers and tuck the zippers under the material.

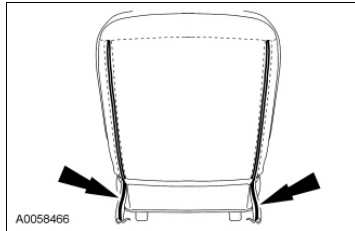


### All vehicles

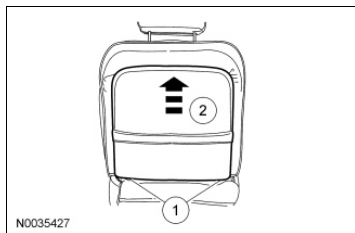
12. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .
-

**Seat Recliner - Manual****Removal and Installation****Police vehicles**

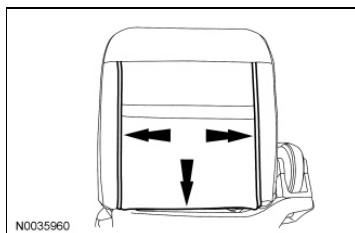
1. Pull the zippers out from underneath the material, unzip both zippers and position the backrest trim cover up to access the backrest trim panel.



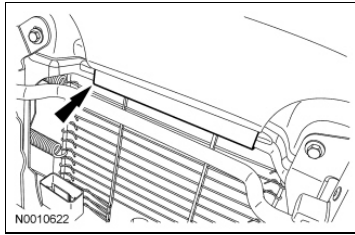
2. Remove the backrest trim panel.
  1. Remove the 2 screws located at the bottom of the backrest trim panel.
  2. Pull out at the bottom and slide the backrest trim panel up to disengage the 2 upper retaining hooks.

**Non-police vehicles**

3. Release the backrest trim cover J-clips.
  - Release the lower J-clip first and then release the 2 side J-clips.

**All vehicles**

4. Remove the backrest recliner handle.
5. Release the side outboard cushion J-clips.
6. Release the cushion trim cover rear J-clip.



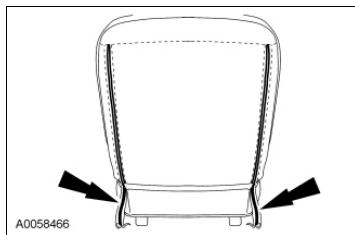
7. Release the cushion trim cover rear corner J-clip.
  8. Remove the recliner assembly. For additional information, refer to Seat - Exploded View, Front in this section.
    - Remove the 2 recliner-to-backrest bolts.
      - ◆ To install, tighten to 55 Nm (41 lb-ft).
    - Remove the 2 recliner-to-seat track bolts.
      - ◆ To install, tighten to 55 Nm (41 lb-ft).
    - Remove the recliner assembly.
  9. To install, reverse the removal procedure.
-

**Seat Recliner - Power****Removal and Installation**

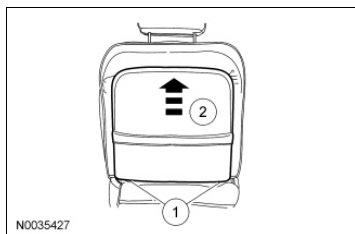
**NOTE:** The power seat backrest recliner assembly must be installed as a new unit. Repair of the power seat backrest recliner assembly components is not acceptable and should not be attempted.

**Police vehicles**

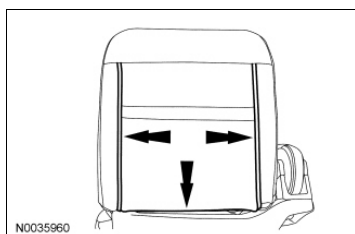
1. Pull the zippers out from underneath the material, unzip both zippers and position the backrest trim cover up to access the backrest trim panel.



2. Remove the backrest trim panel.
  1. Remove the 2 screws located at the bottom of the backrest trim panel.
  2. Pull out at the bottom and slide the backrest trim panel up to disengage the 2 upper retaining hooks.

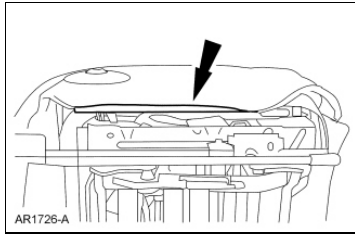
**Non-police vehicles**

3. Release the backrest trim cover J-clips.
  - Release the lower J-clip first and then release the 2 side J-clips.

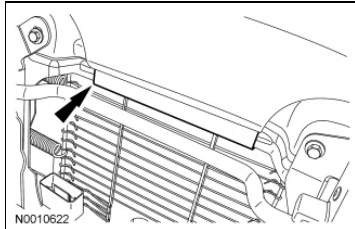
**All vehicles**

4. Release the side outboard cushion J-clip.





5. Release the cushion trim cover rear J-clip.



6. Release the cushion trim cover rear corner J-clip.

7. Disconnect the lumbar assembly electrical connector.

8. Remove the recliner assembly. For additional information, refer to Seat - Exploded View, Front in this section.

- Remove the 2 recliner-to-backrest bolts.
  - ◆ To install, tighten to 55 Nm (41 lb-ft).
- Remove the 2 recliner-to-seat track bolts.
  - ◆ To install, tighten to 55 Nm (41 lb-ft).
- Remove the recliner assembly.

9. To install, reverse the removal procedure.

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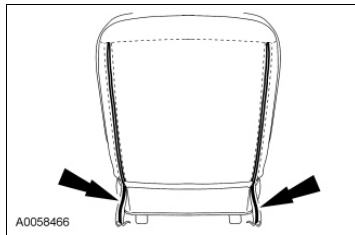
## Lumbar Assembly

### Removal

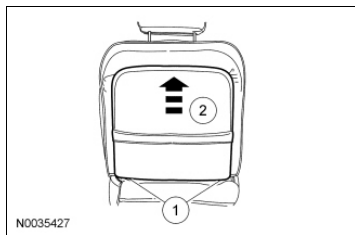
**NOTE:** Driver side shown, passenger similar.

#### Police vehicles

1. Pull the zippers out from underneath the material, unzip both zippers and position the backrest trim cover up to access the backrest trim panel.

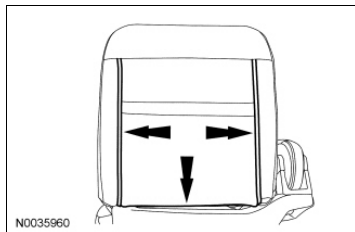


2. Remove the backrest trim panel.
  1. Remove the 2 screws located at the bottom of the backrest trim panel.
  2. Pull out at the bottom and slide the backrest trim panel up to disengage the 2 upper retaining hooks.



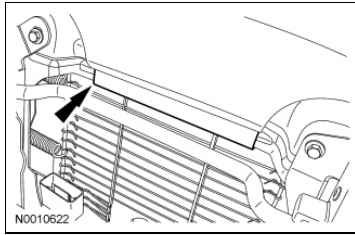
#### Non-police vehicles

3. Release the backrest trim cover J-clips.
  - Release the lower J-clip first and then release the 2 side J-clips.



#### All vehicles

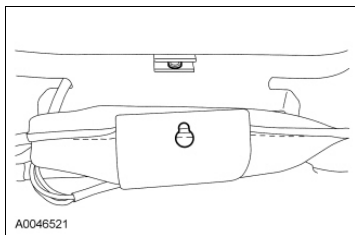
4. Release the rear outboard cushion J-clips.



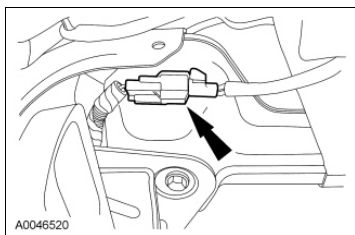
5. Release the cushion trim cover rear corner J-clip.

6. **NOTE:** The lumbar motor, bladder, hose and backing board are serviced as an assembly.

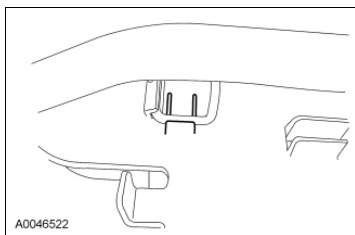
Detach the lumbar motor bracket clip.



7. Disconnect the electrical connector.



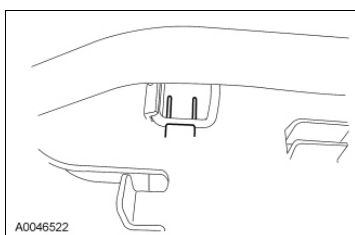
8. Detach the 2 lumbar support bracket clips (1 shown) and slide the lumbar assembly up to remove.



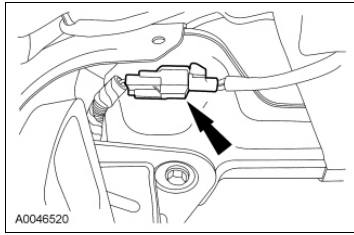
## Installation

### All vehicles

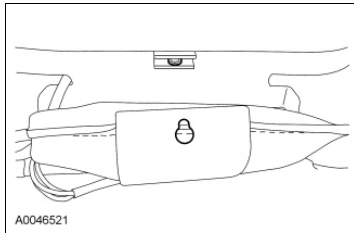
1. Slide the lumbar support bracket and lumbar assembly on the lumbar seat frame until seated on the 2 clips.



2. Connect the electrical connector.

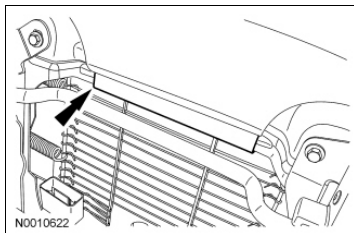


3. Install the lumbar motor and attach the lumbar motor bracket clip.



4. Attach the cushion trim cover rear corner J-clip.

5. Attach the cushion trim cover rear J-clip.

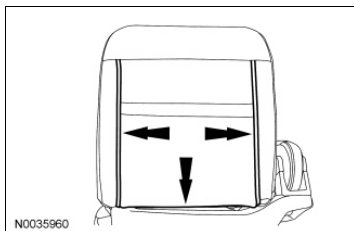


### Non-police vehicles

6. **NOTE:** Note the alignment of the 2 side J-clips at the top of the seat to avoid bunching.

Attach the backrest trim cover J-clips.

- Attach the 2 side J-clips first and then attach the lower J-clip.



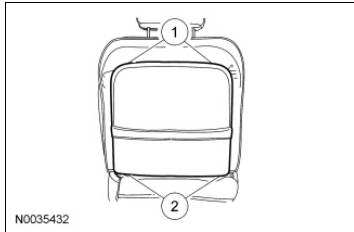
### Police vehicles

7. **NOTICE:** Inspect the seat backrest trim panel retaining hooks for damage. If damaged, install a new seat backrest trim panel.

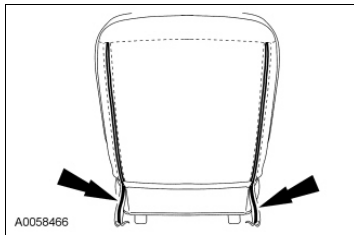
Install the backrest trim panel.

## 2010 Crown Victoria, Grand Marquis Workshop Manual

1. Angle the top of the seat backrest trim panel inward and down to engage the 2 upper retaining hooks to the backrest frame.
2. Push in on the lower backrest trim panel and install the 2 screws.



8. Pull the seat backrest material down, zip both zippers and tuck the zippers under the material.



## **Lumbar Control Switch**

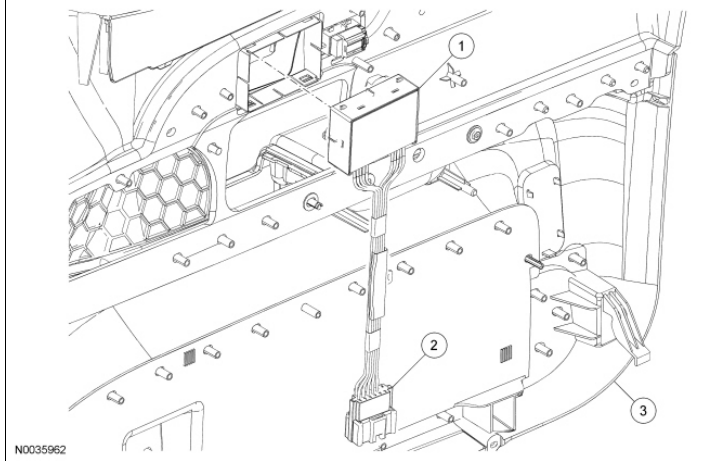
### **Removal and Installation**

**NOTE:** Driver side shown, passenger similar.

1. Remove the lumbar control switch.
    - Release the tabs and remove the power lumbar bezel.
    - Disconnect the electrical connector.
    - Remove the lumbar control switch.
  2. To install, reverse the removal procedure.
-

**Seat Control Switch**

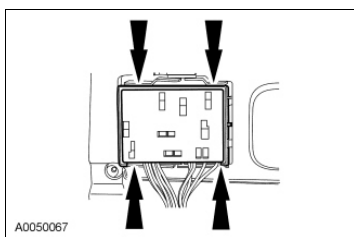
**NOTE:** Driver side shown, passenger similar.



Item	Part Number	Description
1	14A701	Seat control switch
2	-	Electrical connector (part of 14A701)
3	23942 RH/ 23943 LH	Front door trim panel

**Removal and Installation**

1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#) .
2. Remove the seat control switch.
  - Separate the electrical connector and wire harness from the door panel.
  - Release the locking tabs in the door panel and remove the front seat control switch.



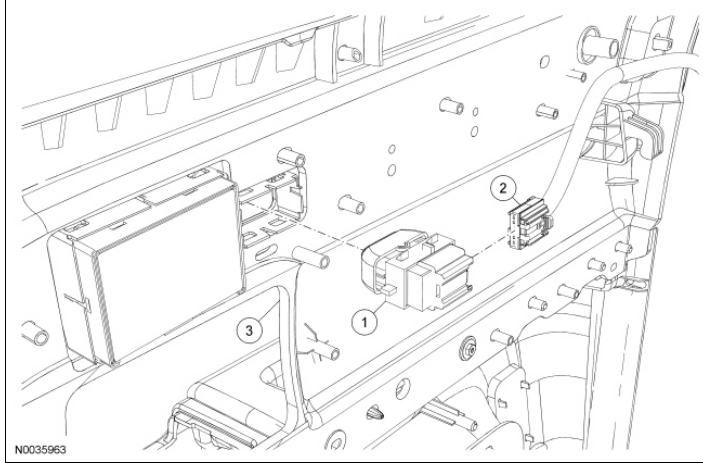
3. To install, reverse the removal procedure.





**Heated Seat Switch**

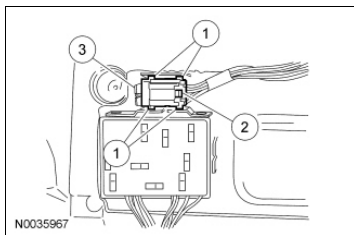
**NOTE:** Driver side shown, passenger similar.



Item	Part Number	Description
1	-	Heated seat switch
2	-	Electrical connector
3	23942 RH/ 23943 LH	Front door trim panel

**Removal and Installation**

1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the heated seat switch.
  1. Release the locking tabs.
  2. Disconnect the electrical connector.
  3. Remove the heated seat switch.



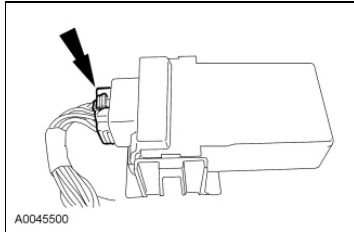
3. To install, reverse the removal procedure.



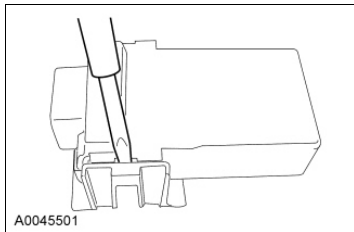
## Heated Seat Module

### Removal and Installation

1. Remove the affected seat. For additional information, refer to [Seat - Front](#) in this section.
2. Disconnect the electrical connector.



3. Remove the heated seat module.
  - Insert a flat-blade screwdriver into the heated seat module bracket and release the locking tab.
  - For installation, make sure the locking tab is correctly seated.



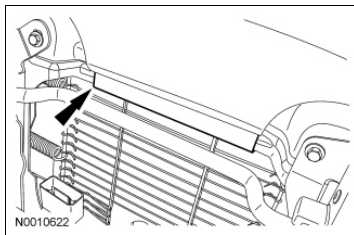
4. To install, reverse the removal procedure.
-

## Seat Track

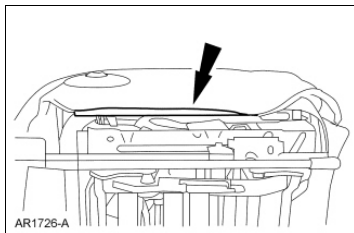
### Removal and Installation

**NOTICE:** Use care when handling the seat and track assembly. Dropping the assembly or sitting on a seat not secured in the vehicle may result in damaged components.

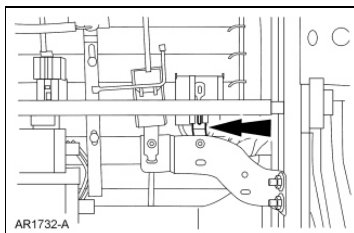
1. Remove the seat. For additional information, refer to Seat - Front in this section.
2. Remove the safety belt buckle.
  - Remove the nut.
  - For driver seat, disconnect the safety belt buckle switch electrical connector.
  - For passenger seat, disconnect the safety belt buckle switch and Belt Tension Sensor (BTS) electrical connectors.
  - Remove the safety belt buckle.
  - To install, tighten to 48 Nm (35 lb-ft).
3. Release the cushion trim cover rear J-clip.



4. Release the cushion trim cover rear corner J-clip.
5. Release the J-clip.



6. Detach the electrical connector.

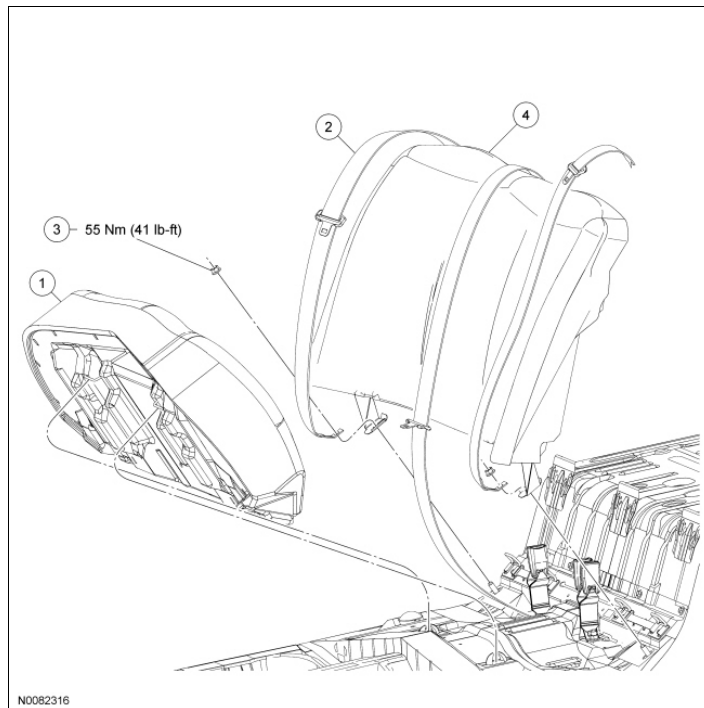


7. For driver seat, disconnect the seat position sensor electrical connector.
8. Remove the 2 recliner-to-seat track bolts.

- To install, tighten to 55 Nm (41 lb-ft).
9. Remove the pivot bolt.
- To install, tighten to 45 Nm (33 lb-ft).
10. Remove the seat track.
- Disconnect any remaining electrical connectors.
  - Remove the 4 seat track-to-cushion frame bolts and seat track.
    - ◆ To install, tighten to 20 Nm (177 lb-in).
11. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

---

**Seat - Rear**

Item	Part Number	Description
1	-	Rear seat cushion
2	611B68 RH/ 611B69 LH	Safety belt retractor, outer (2 required)
3	N800937	Rear seat backrest nut (2 required)
4	-	Rear seat backrest

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.


For police vehicles equipped with a fire suppression system, depower the system.

2. Apply pressure to the lower front portion of the rear seat cushion. Push the rear seat cushion rearward to disengage the front retainers. Remove the rear seat cushion.
3. Remove the 2 rear seat backrest nuts, safety belt anchors and rear seat backrest.
  - To install, tighten to 55 Nm (41 lb-ft).

4. **⚠ WARNING:** The retaining wires in the rear seat cushion foam pad and frame, and rear seat backrest foam pad and frame must be fully seated in the retainer brackets to prevent the seat backrest and seat cushion from sliding forward in the event of a crash. Failure to follow these instructions may increase the risk of serious personal injury or death in a crash.

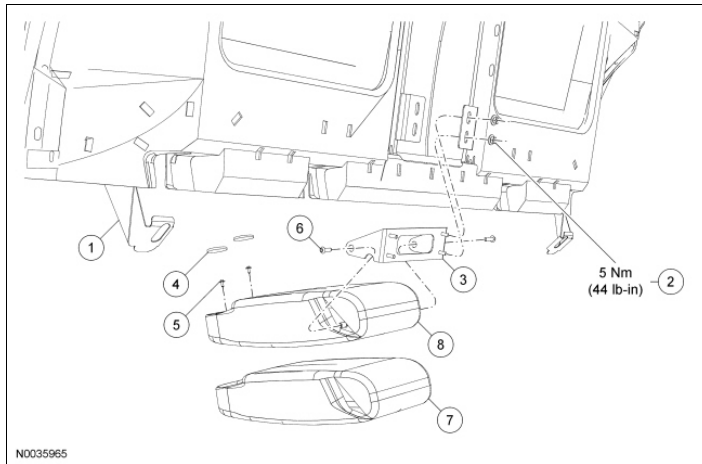
**NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

5.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

For police vehicles equipped with a fire suppression system, repower the system.

---

**Seat Armrest - Rear**

Item	Part Number	Description
1	-	Rear seat backrest (frame/pad/trim cover)
2	N621906	Armrest-to-backrest nut (4 required)
3	67210	Armrest bracket
4	13562	Rubber insert (2 required)
5	60108	Screw (2 required)
6	N800958	Hinge screw (2 required)
7	67273	Armrest trim cover
8	67244	Armrest

**Removal and Installation**

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.


For police vehicles equipped with a fire suppression system, depower the system.

- Remove the rear seat cushion and backrest. For additional information, refer to [Seat - Rear](#) in this section.
- Remove the 4 nuts.
  - To install, tighten to 5 Nm (44 lb-in).
- Remove the armrest.
- ⚠ WARNING:** The retaining wires in the rear seat cushion foam pad and frame, and rear seat backrest foam pad and frame must be fully seated in the retainer brackets to prevent the seat backrest and seat cushion from sliding forward in the event of a crash. Failure to follow these instructions may increase the risk of serious personal injury or death in a crash.

**NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

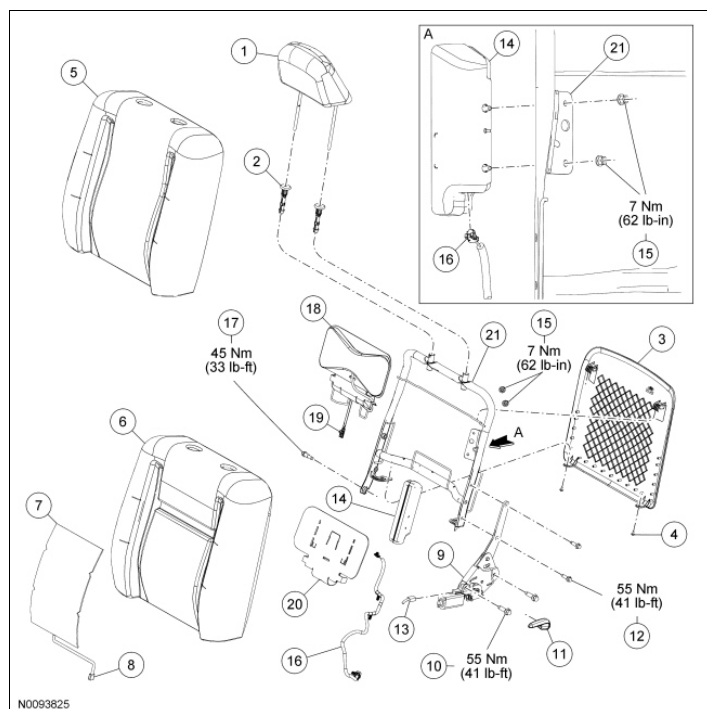


To install, reverse the removal procedure.

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

For police vehicles equipped with a fire suppression system, repower the system.

---

**Seat Backrest - Front****NOTE:** Driver seat shown, passenger similar.**NOTE:** Front 50 percent seat shown, 40 percent similar.

Item	Part Number	Description
1	611A08	Head restraint assembly
2	610A18	Head restraint guide (2 required)
3	60770	Seat back trim panel (police only)
4	-	Seat back trim panel screw (2 required, police only)
5	64416	Backrest trim cover
6	64810	Backrest foam pad
7	14D696	Backrest heater mat (if equipped)
8	-	Electrical connector (if equipped, part of 14D696)
9	62648/62649	Recliner assembly (power shown, if equipped)
10	N803463	Recliner-to-seat track bolt (2 required)
11	61198	Recliner handle
12	N803463	Recliner-to-backrest frame bolt (2 required)
13	-	Electrical connector (if equipped)
14	611D10	Side air bag module
15	N620480	Side air bag module nuts (2 required)
16	14716	Side air bag module wiring harness
17	N808123	Pivot bolt
18	65500	Lumbar assembly, power (if equipped)

19	-	Electrical connector (if equipped)
20	-	Lumbar support
21	61018	Backrest frame

**Disassembly**

**⚠ WARNING:** Always carry or place a live air bag module with the air bag and deployment door/trim cover/tear seam pointed away from the body. Do not set a live air bag module down with the deployment door/trim cover/tear seam face down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

**⚠ WARNING:** If the seat side air bag cover has been damaged or separated from its mounting, or if the air bag material has been exposed, install a new seat side air bag module. Never try to repair the seat side air bag module. Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

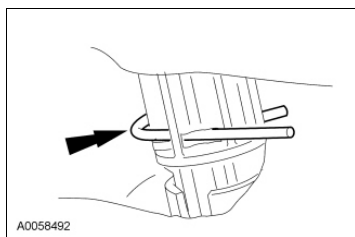
**⚠ WARNING:** Front seat backrest trim covers installed on seats equipped with seat side air bags cannot be repaired. A new trim cover must be installed. Cleaning is permissible. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.

**NOTE:** If a side air bag deployment took place the seat backrest foam pad, trim cover and side air bag module must be installed new. The backrest frame should be installed new if necessary.

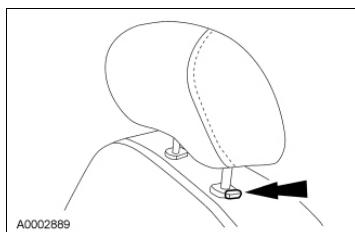
**NOTE:** If a seat backrest heater mat is faulty, a new seat backrest foam pad must be installed with the heater mat. Do not reuse the original seat backrest foam pad.

**All vehicles**

1. Remove the front seat backrest. For additional information, refer to [Seat Backrest - Front](#) in this section.
2. If police vehicle, remove the head restraint locking clip (outboard side - driver, inboard side - passenger).



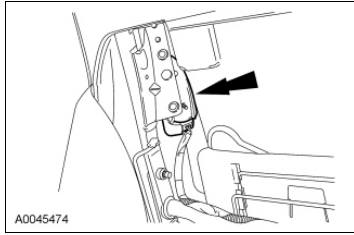
3. Press the release button and remove the head restraint.



4. **NOTE:** If installing a new side air bag module, use new retaining nuts. If the same side air bag module is to be reused, then reuse the side air bag module nuts.

Remove the 2 side air bag retaining nuts and discard (if required).

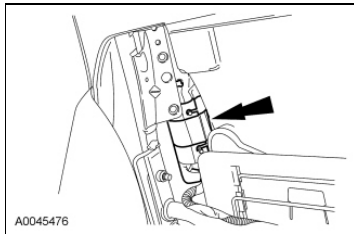
5. Position the side air bag module and deployment chute away from the mounting bracket and seat backrest frame.



6. Position the backrest trim cover and backrest foam pad forward enough to access the side air bag module.

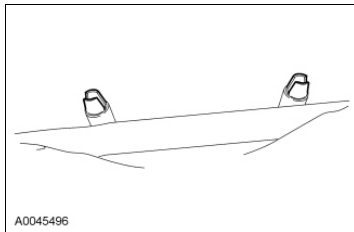
7. Remove the side air bag module from the deployment chute.

- Pull the side air bag module mounting studs back through the deployment chute openings and remove the side air bag module from the deployment chute.



8. Disconnect the electrical connector and remove the side air bag module.

9. From inside the seat backrest, pinch the headrest guide pin ends and remove the sleeves.

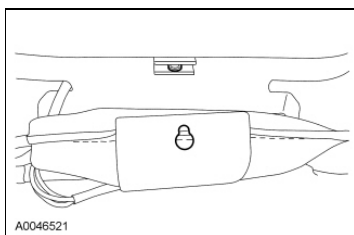


10. Remove the backrest foam pad and trim cover.

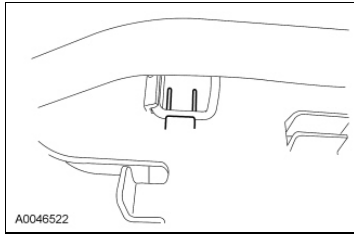
- Separate the trim cover from the backrest foam pad.

### **Vehicles with power lumbar**

11. Detach the lumbar motor bracket clip.



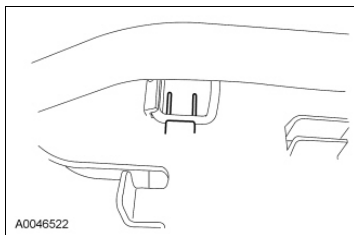
12. Detach the 2 lumbar support bracket clips and slide the lumbar assembly up and off.



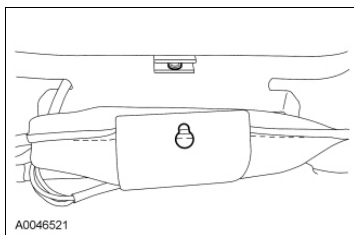
## Assembly

### Vehicles with power lumbar

1. Slide the lumbar support bracket and lumbar assembly onto the seat frame until seated on the 2 clips.

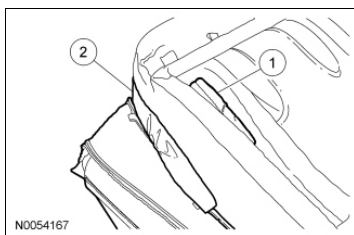


2. Install the lumbar motor and attach the lumbar motor bracket clip.

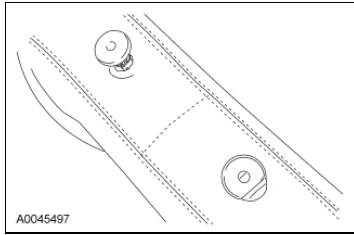


### All vehicles

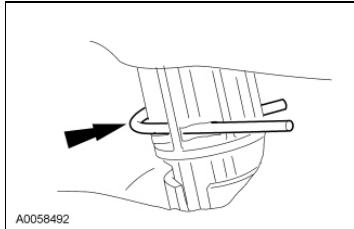
3. Position the backrest trim cover to the backrest foam pad.
  1. With the backrest trim cover inside out, feed the side air bag module deployment chute through the backrest foam pad opening.
  2. Make sure the deflector flap is positioned as shown.



4. Position the backrest trim cover around the backrest foam pad and attach the hook-and-loop strips.
  - Make sure the side air bag deflector flap is positioned between the backrest trim cover and the backrest foam pad.
5. Align the backrest foam pad and trim cover to the backrest frame.
6. Install the head restraint sleeves.



7. If police vehicle, install the head restraint locking clip onto the head restraint sleeve.



8. Connect the side air bag module electrical connector.

9. **⚠ WARNING:** Before installing the seat side air bag module/deployment chute assembly:

- ◆ Inspect the side air bag module and mounting surfaces for any damage or foreign material.
- ◆ Remove any foreign material from the mounting surfaces of the deployment chute, the seat backrest frame mounting bracket and the air bag module cavity in the seat backrest foam pad.
- ◆ Install new parts if damaged.

Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

**⚠ WARNING:** Inspect the seat side air bag module and mounting surfaces for any damage or foreign material before installing the seat side air bag module. If any damage is found, install new components. If any foreign material is found, remove it. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.

**⚠ WARNING:** If the seat side air bag cover has been damaged or separated from its mounting, or if the air bag material has been exposed, install a new seat side air bag module. Never try to repair the seat side air bag module. Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

**⚠ WARNING:** Check the seat side air bag deployment chute for damage. The deployment chute must not be repaired. If there is any damage to the deployment chute, a new seat back trim cover and deployment chute must be installed as a unit. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.

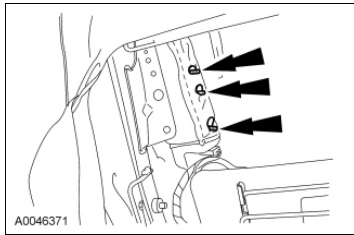
**⚠ WARNING:** If the seat side air bag module deployment chute is not correctly positioned and closed, the seat side air bag module may not deploy correctly. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increases the risk of serious personal injury or death in a crash.

Position the side air bag module into the deployment chute.

- Position the side air bag module into the deployment chute with the alignment pin offset to

the top and the electrical connector to the bottom of the seat backrest. This will position the alignment pin correctly when the side air bag module and deployment chute are mounted to the backrest frame mounting bracket.

- The side air bag module mounting studs and alignment pin must come through the deployment chute stud openings.



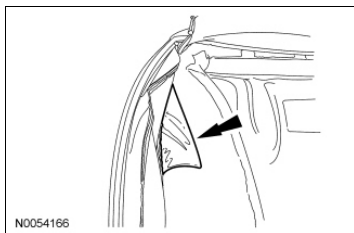
10. Install the side air bag.

- Install the side air bag module onto the front seat backrest frame mounting bracket.
  - ♦ The deployment chute should not have any wrinkles or folds where it contacts the seat back frame mounting bracket.
- Install the 2 side air bag module nuts (new nuts, if required).
  - ♦ Tighten to 7 Nm (62 lb-in).

11. Reposition the backrest foam pad and trim cover to the backrest frame.

12. **NOTE:** The backrest frame and side air bag module have been removed from view for clarity.

Make sure the deflector flap lays flat between the backrest trim cover and backrest foam pad.



13. Install the head restraint.

14. Install the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.

15. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .

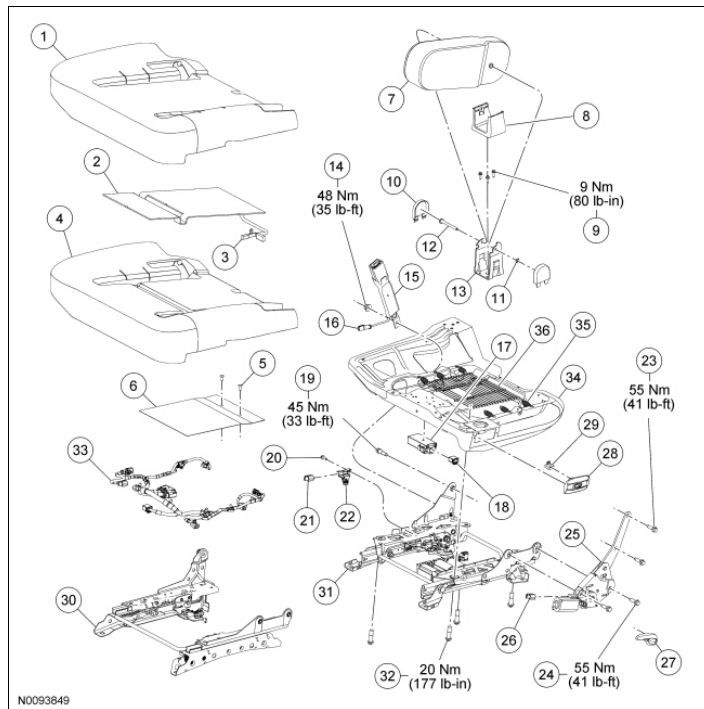




**Seat Cushion - Front****Driver Cushion**

**NOTE:** Driver seat shown. For disassembly and assembly of the passenger seat cushion, refer to Occupant Classification Sensor procedure in [Section 501-20B](#).

**NOTE:** Fifty percent seat shown, 40 percent similar.



Item	Part Number	Description
1	62900	Cushion trim cover
2	14D696	Cushion heater mat (if equipped)
3	-	Electrical connector (if equipped, part of 14D696)
4	632A22	Cushion foam pad
5	-	Pushpin
6	-	Mat
7	65478/644A18	Armrest pad/cover (if equipped)
8	672A32	Armrest cover trim (if equipped)
9	N611624	Armrest bracket bolt (3 required, if equipped)
10	672A28	Pin cover (2 required, if equipped)
11	W623464	Retaining clip (if equipped)
12	65476	Pin (if equipped)
13	63076	Armrest bracket (if equipped)
14	-	Nut, safety belt buckle

15	61202 RH/ 61203 LH	Safety belt buckle
16	-	Electrical connector
17	14C724	Heated seat module (if equipped)
18	-	Electrical connector
19	N808123	Pivot bolt
20	-	Bolt, seat position sensor (driver only)
21	-	Electrical connector (driver only)
22	-	Seat position sensor (driver only)
23	N803463	Recliner-to-backrest bolt (2 required)
24	N803463	Recliner-to-seat track bolt (2 required)
25	62648 RH/ 62649 LH	Recliner, power (if equipped)
26	-	Electrical connector (part of 14A699, if equipped)
27	61198	Recliner handle, manual
28	-	Lumbar control switch
29	-	Electrical connector
30	61704 RH/ 61705 LH	Manual seat track
31	61710	Power seat track
32	N802906	Seat track-to-cushion frame bolt (4 required)
33	14A699	Seat wiring harness
34	63100	Cushion frame
35	603A06	Cushion support spring (6 required)
36	63226	Seat cushion support

**Disassembly**

**NOTE:** If a driver seat cushion heater mat is faulty, a new seat cushion foam pad must be installed with the new heater mat. Do not reuse the original seat cushion foam pad.

**NOTE:** The heater mat on the front passenger seat cushion is not serviceable separately. If a new heater mat is needed on the front passenger seat cushion, a new Occupant Classification Sensor (OCS) system service kit and a new heater mat must be installed. Refer to Section 501-20B .

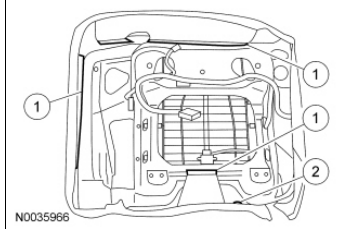
**Passenger seat**

1. Remove the OCS system components. For additional information, refer to Occupant Classification Sensor procedure in Section 501-20B .

**All seats**

2. Remove the seat. For additional information, refer to Seat - Front in this section.
3. Remove the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.

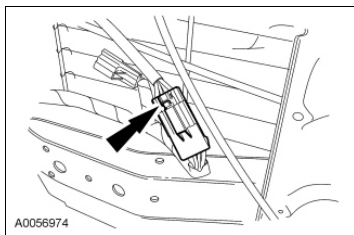
4. Remove the seat track. For additional information, refer to [Seat Track](#) in this section.
5. If equipped, remove the power lumbar switch:
  - Release the tabs and remove the power lumbar bezel.
  - Disconnect the power lumbar switch electrical connector.
6. Release the retainers.
  1. Release the J-clip retainers.
  2. Remove the pin-type retainer.



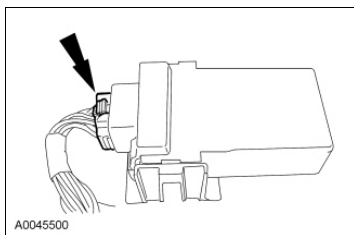
7. If equipped, remove the seat armrest and bracket.
  - Remove the 2 covers, retaining clip and armrest pin.
  - Remove the armrest.
  - Remove the cover, 3 bolts and armrest bracket.

### Heated seats

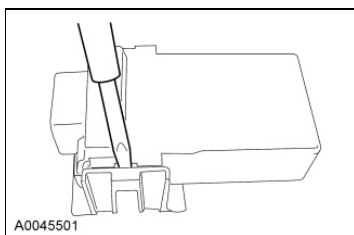
8. Disconnect the cushion heater mat electrical connector.



9. Disconnect the heated seat module electrical connector.



10. Release the locking tab and remove the heated seat module.



### All seats

11. Remove the cushion frame.
12. If necessary, remove the 2 pushpins and the cushion mat. Otherwise, position the mat aside.
13. Remove the seat cushion trim cover from the foam pad.
14. Remove the cushion support.

## Assembly

### Passenger seat

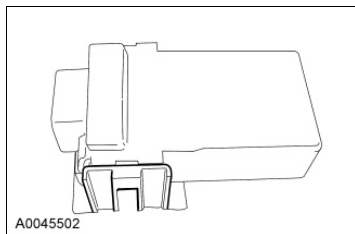
1. Install the OCS system components. For additional information, refer to Occupant Classification Sensor procedure in Section 501-20B .

### All seats

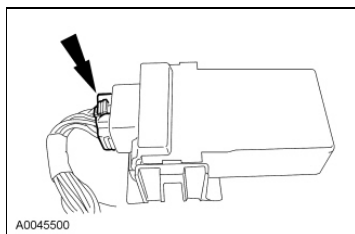
2. Install the cushion support to the cushion frame.
3. Install the seat cushion trim cover to the foam pad.
4. Position the mat over the cushion support and install the 2 pushpins.
5. Install the frame.

### Heated seats

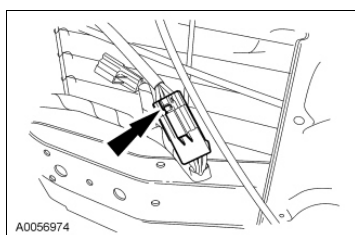
6. Slide the heated seat module onto the bracket until fully seated.



7. Connect the heated seat module electrical connector.



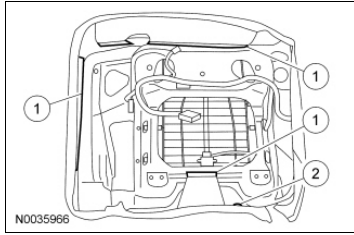
8. Connect the cushion heater mat electrical connector.



## All seats

9. Fasten the cushion trim cover retainers.

1. Fasten the J-clips.
2. Install the pin-type retainer.



10. If equipped with power lumbar:

- connect the power lumbar electrical connector.
- install the power lumbar switch bezel.

11. If equipped, install the seat armrest and bracket.

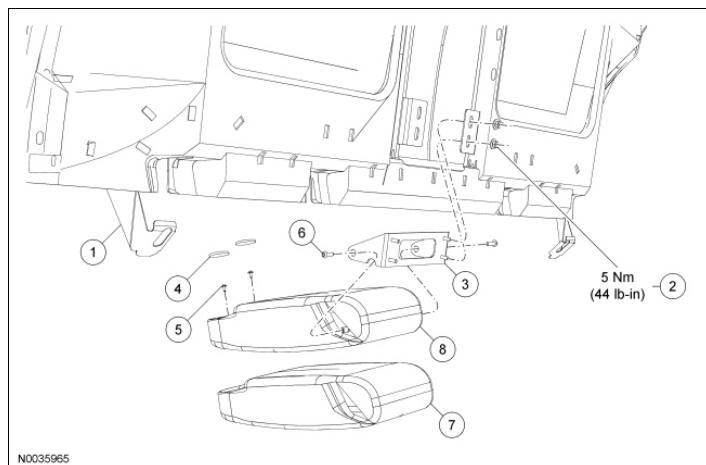
- Install the armrest bracket, 3 bolts and cover.
- Install the armrest.
- Install the armrest pin, retaining clip and covers.

12. Install the seat track. For additional information, refer to Seat Track in this section.

13. Install the front seat backrest. For additional information, refer to Seat Backrest - Front in this section.

14. Install the seat. For additional information, refer to Seat - Front in this section.

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**Seat Armrest - Rear****NOTE:** Rear of backrest shown.

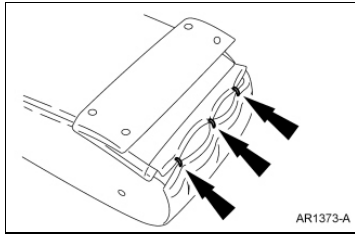
Item	Part Number	Description
1	-	Rear seat backrest
2	N621906	Armrest-to-backrest nut (4 required)
3	67210	Armrest bracket
4	13562	Rubber insert (2 required)
5	60108	Screw (2 required)
6	N800958	Hinge screw (2 required)
7	67273	Armrest trim cover
8	67244	Armrest

**Disassembly and Assembly**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

For police vehicles equipped with a fire suppression system, depower the system.

2. Remove the armrest. For additional information, refer to **Seat Armrest - Rear** in this section.
3. Remove the rubber inserts from the armrest cup holder.
4. Remove the 2 screws from the armrest cup holder.
5. Remove the 2 pivot screws from the armrest.
6. Remove the hog rings.



7. Remove the armrest trim cover.
8. To assemble, reverse the disassembly procedure.
9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

For police vehicles equipped with a fire suppression system, repower the system.

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**Window Regulator Electric Drive Current Draw**

<b>Description</b>	<b>Specification</b>
No Load	5 amperes or less at 12.8 volts

**Material**

<b>Item</b>	<b>Specification</b>	<b>Fill Capacity</b>
Dow Urethane Adhesive Betaseal® Express	-	-
Dow Urethane One Step Glass Primer Betaprime® 5500 / 5500A / 5500SA	-	-
Foam Core Butyl E69Z-19562-A	WSB-M3G143-B1	-
Lacquer Touch-Up Paint (match color to exterior grid wire) PM-19500-XXXX	ESR-M2P100-C	-
Rear Window Defroster Repair PM-11 (US); CPM-11 (Canada)	-	-
Sika Urethane Adhesive Sika Tack ASAP	-	-
Sika Urethane Metal and Glass Primer Sika 206 G+P	-	-
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A	-

**General Specifications**

<b>Item</b>	<b>Specification</b>
Polypropylene Film Fine Line Tape (commercially available)	-
Terminal Kit - Back Glass 4F1Z-14421-AA	-

**Torque Specifications**



<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Front door glass run channel bolts	12	106
Front door glass top run bolt	12	106
Front door window regulator motor bolts	6	53
Front door window regulator nuts	12	106
Outer belt line moulding nut	12	106
Outside weatherstrip nut	12	106
Rear door glass run channel bolts	10	89
Rear door glass top run inner bolt	10	89
Rear door glass top run outer bolt	12	106
Rear door window regulator motor bolts	6	53
Rear door window regulator nuts	6	53
Window glass-to-channel bracket nut	13	115

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**Glass, Frames and Mechanisms**

The glass, frames and mechanisms consist of the:

- window control switches.
- window regulators.
- window regulator motors.
- door glass.
- door glass top runs.
- rear quarter glass.
- heated rear window.
- rear window defrost switch.
- rear window defrost relay.
- Driver Door Module (DDM)

The rear door glass top run contains the quarter glass and is removed as an assembly.

The power window system can be operated from the driver window control switch or from the window control switches located on each door panel. The driver window control switch has 2 modes of operation for the driver power window, manual and auto. All other windows operate in manual mode only.

Manual mode moves the window downward until the switch is released. Auto mode provides the one-touch down feature for the driver front power window. The one-touch down function allows the driver front power window to be completely lowered when the driver window control switch is pressed momentarily and then released. The one-touch down feature is controlled by the driver window control switch.

The power window system will only operate if:

- the ignition is in the RUN or ACC position.
- the accessory delay feature is in the active mode.




The heated rear window is controlled by the DDM . The ignition switch must be in RUN for the heated rear window to operate. When the rear window defrost switch is pressed, the DDM activates the rear window defrost relay which supplies voltage to the antenna module and the rear window defrost grid.

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**Glass, Frames and Mechanisms**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 105-R025B or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation****Power Window Control**

The driver power window one-touch down feature is controlled by the driver window control switch with integrated electronics. The one-touch down feature is requested by momentarily pressing the driver window down switch for 32 ms to 480 ms. The initial voltage input from the down switch starts the one-touch down operation. If the voltage input is less than 480 ms, the driver window control switch maintains the voltage supply to the window regulator motor down circuit. The Battery Junction Box (BJB) accessory delay relay supplies the voltage to the switch for one-touch down operation. The switch maintains the one-touch down operation until one of the following occur:

- Seven seconds expire
- The switch detects the motor is stalled by monitoring the current draw
- A voltage input is received by the switch on either the up or down switch circuits

There is only one ground for the switch and it is used for normal window operation and for one-touch down operation, making diagnostics simpler. If the ground is open, all window operations (one-touch and normal) are inoperative. The switch monitors the voltage on the down circuit for the driver window. If the switch continues to detect voltage on the down circuit for more than 480 ms after initial activation, the switch does not enable one-touch down operation. The down circuit through the switch is a direct connection to the motor in normal window operation mode. This allows the driver window switch to control the motor for normal operation.

The passenger window motors are hardwired directly to the window regulator control switches.

The window regulator motor has built-in circuit protection to prevent overheating due to excessive or repeated current draw.

If the window motor is cycled against significant resistance, the circuit protection function may be activated. This prevents operation of the window motor for several minutes.

Intermittent operation due to activation of the circuit protection is NOT a sign of window motor failure. Intermittent window operation is indicative of significant resistance to the movement of the glass or excessive duty cycle (repeated glass cycling). Significant resistance to window function may also be caused by extreme cold temperatures or build-up of frost or ice on the glass.

The glass cycle time from full down to full up should be less than 3.5 seconds at an ambient temperature of 22°C (72°F). Verification of glass cycle time MUST be conducted at or above this temperature.

## Rear Window Defrost

The rear window defrost is controlled by the Driver Door Module (DDM). The ignition switch must be in RUN for the rear window defrost to operate. Pressing the rear window defrost switch grounds the input to the DDM. If the module detects the ignition switch in RUN, ground is supplied to the rear window defrost relay output. The rear window defrost relay coil is energized which closes the contacts and supplies voltage to the antenna module. The antenna module then supplies voltage and ground to the rear window defrost grid.

## Inspection and Verification

**⚠ WARNING: If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

## Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Power window regulator</li> <li>• Window run weather-strip</li> <li>• Door window glass</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse(s): <ul style="list-style-type: none"> <li>◆ 24 (10A)</li> <li>◆ 107 (40A)</li> </ul> </li> <li>• BJB circuit breaker 602 (20A)</li> <li>• Central Junction Box (CJB) fuse 9 (7.5A)</li> <li>• Driver Door Module (DDM)</li> <li>• Window control switch</li> <li>• Window regulator motor</li> <li>• Rear window defrost relay</li> <li>• Accessory delay relay</li> <li>• Rear window defrost switch</li> <li>• Rear window defrost grid</li> <li>• Antenna module</li> <li>• Loose, corroded connectors</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- verify the ignition key is in the ON position.
- verify the scan tool operation with a known good vehicle.
- refer to Section 418-00 to diagnose no response from the DDM .

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the CMDTCs and carry out the self-test diagnostics for the DDM .

9. If the DTCs retrieved are related to the concern, go to Driver Door Module (DDM) DTC Chart. For all other DTCs, refer to Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Chart

### Driver Door Module (DDM) DTC Chart

DTC	Description	Action
B1342	ECU is Faulted	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new Driver Door Module (DDM). REFER to <u>Section 419-10</u> .
B1345	Heated Backlite Input Circuit Short to Ground	<u>GO to Pinpoint Test G</u> .
B1349	Heated Backlite Relay Short to Battery	<u>GO to Pinpoint Test F</u> .
All Other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: All the Power Windows are Inoperative

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

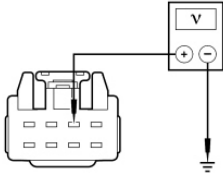
#### Normal Operation

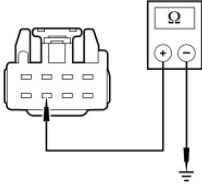
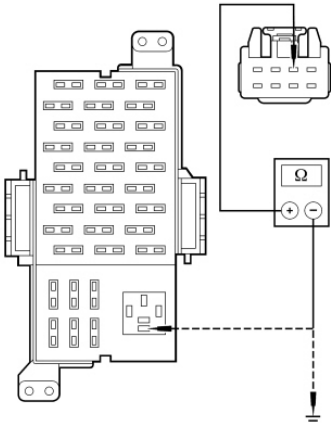
With the key in the ACC or RUN position the voltage is supplied to the coil side of the accessory delay relay through circuit 964 (DB/LG). When the accessory delay relay is energized, battery voltage is supplied to the driver window control switch on circuit 193 (YE/LG). The driver window control switch provides voltage and ground to all other window control switches. The driver window control switch is grounded through circuit 57 (BK).

#### This pinpoint test is intended to diagnose the following:

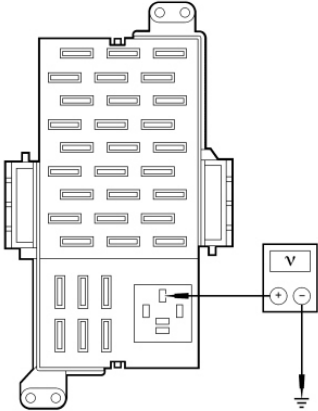
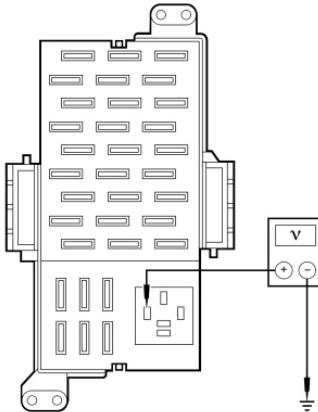
- Fuse(s)
- Circuit breaker
- Wiring, terminals or connectors
- Accessory delay relay
- Driver window control switch

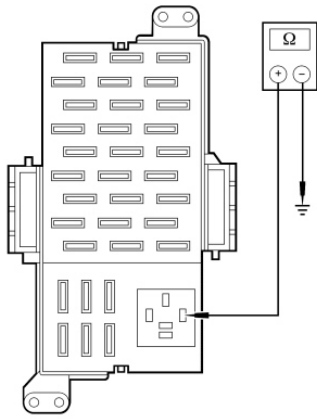
#### PINPOINT TEST A: ALL THE POWER WINDOWS ARE INOPERATIVE

Test Step	Result / Action to Take
<b>A1 CHECK CIRCUIT 193 (YE/LG) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Window Control Switch C504b.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between driver window control switch C504b-2, circuit 193 (YE/LG), harness side and ground.</li> </ul>  <p>N0088562</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A2 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Driver Window Control Switch C504a.</li> <li>• Measure the resistance between driver window control switch C504a-7, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0088563</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> INSTALL a new driver window control switch. REFER to <u>Window Control Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>A3 CHECK CIRCUIT 193 (YE/LG) FOR AN OPEN OR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Accessory Delay Relay.</li> <li>• Measure the resistance between driver window control switch C504b-2, circuit 193 (YE/LG), harness side and the accessory delay relay pin 87, circuit 193 (YE/LG), harness side; and between driver window control switch C504b-2, circuit 193 (YE/LG), harness side and ground.</li> </ul>  <p>N0093780</p> <p>• Is the resistance less than 5 ohms between the driver window control switch and the accessory relay; and greater than 10,000 ohms between the driver window control switch and ground?</p>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>A4 CHECK CIRCUIT 768 (BN/YE) FOR VOLTAGE</b></p>	



<ul style="list-style-type: none"> <li>• Measure the voltage between accessory delay relay pin 30, circuit 768 (BN/YE), harness side and ground.</li> </ul>  <p>N0052509</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> VERIFY the Battery Junction Box (BJB) circuit breaker 602 (20A) is OK. If OK, REPAIR the circuit. TEST the system for normal operation. If not OK, REFER to Wiring Diagrams Manual to identify the possible causes of the circuit short. REPAIR the circuit. TEST the system for normal operation.</p>
<b>A5 CHECK CIRCUIT 964 (DB/LG) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between accessory delay relay pin 86, circuit 964 (DB/LG), harness side and ground.</li> </ul>  <p>N0070848</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 9 (7.5A) is OK. If OK, REPAIR the circuit. TEST the system for normal operation. If not OK, REFER to Wiring Diagrams Manual to identify the possible causes of the circuit short. REPAIR the circuit. TEST the system for normal operation.</p>
<b>A6 CHECK THE ACCESSORY DELAY RELAY CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between accessory delay relay pin 85, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new accessory delay relay. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>



- Is the resistance less than 5 ohms?

### Pinpoint Test B: A Single Power Window is Inoperative - Driver

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

#### Normal Operation

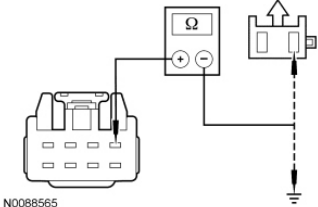
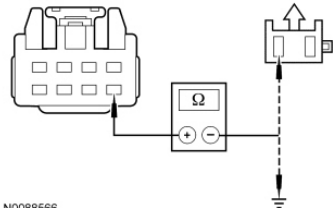
When the driver window is operated in the down direction, voltage is supplied to the driver window motor from the driver window control switch on circuit 227 (YE) and ground is supplied on through circuit 226 (WH/BK). When the driver window is operated in the up direction, voltage is supplied on circuit 226 (WH/BK) and ground through circuit 227 (YE).

#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Driver window control switch
- Driver window motor

### PINPOINT TEST B: A SINGLE POWER WINDOW IS INOPERATIVE - DRIVER

Test Step	Result / Action to Take
<b>B1 CHECK FOR A SHORTED DRIVER WINDOW CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Driver Window Control Switch C504a, C504b.</li> <li>• Carry out the driver window control switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Does the driver window control switch pass the component test?</b></li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> INSTALL a new driver window control switch. REFER to <u>Window Control Switch</u> in this section. TEST the system for normal operation.</p>
<b>B2 CHECK CIRCUIT 227 (YE) FOR AN OPEN OR SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Driver Window Motor C524.</li> <li>• Measure the resistance between driver window control switch C504b-1, circuit 227 (YE), harness side and driver window motor C524-2, circuit 227 (YE), harness side; and between driver window control switch C504b-1, circuit 227 (YE), harness side and ground.</li> </ul>  <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the switch and motor; and greater than 10,000 ohms between the switch and ground?</li> </ul>	<p><b>Yes</b> GO to <b>B3</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>B3 CHECK CIRCUIT 226 (WH/BK) FOR AN OPEN OR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between driver window control switch C504b-5, circuit 226 (WH/BK), harness side and driver window motor C524-1, circuit 226 (WH/BK), harness side; and between driver window control switch C504b-5, circuit 226 (WH/BK), harness side and ground.</li> </ul>  <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the switch and motor; and greater than 10,000 ohms between the switch and ground?</li> </ul>	<p><b>Yes</b> INSTALL a new driver window regulator motor. REFER to <u>Window Regulator Motor - Front Door</u> in this section.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

### Pinpoint Test C: A Single Power Window is Inoperative - Passenger Front

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

#### Normal Operation

Voltage is supplied to the passenger front window control switch from the driver window control switch through circuit 170 (RD/LB). If the driver window control switch is in the LOCK position, the circuit is open and the window does not operate from the passenger front window control switch.

When operating the passenger front window in the down direction, ground is provided from the driver window control switch through circuit 313 (WH/YE). Voltage is supplied to the passenger front window motor through circuit 333 (YE/RD) and ground through circuit 334 (RD/YE).

When operating the passenger front window in the up direction, ground is received from the driver window control switch through circuit 314 (TN/LB). Voltage is supplied to the passenger front window motor through circuit 334 (RD/YE) and ground through circuit 333 (YE/RD).

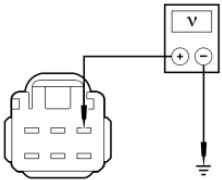
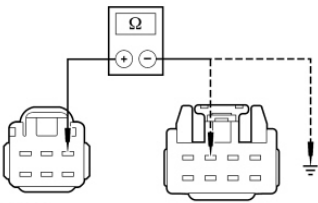
When the passenger front window is operated in the down direction from the driver window control switch, voltage is sent to the passenger front window control switch through circuit 314 (TN/LB), which transfers voltage to the passenger front window motor through circuit 333 (YE/RD). Ground is provided to the RH front window switch through circuit 313 (WH/YE), which transfers ground to the passenger front window motor through circuit 334 (RD/YE). When the passenger front window is operated in the up direction from the driver window control switch, voltage is sent to the passenger front window control switch through circuit 313 (WH/YE), which transfers voltage to the passenger front window motor through circuit 334 (RD/YE). Ground is provided to the passenger front window switch through circuit 314 (TN/LB), which transfers ground to the passenger front window motor through circuit 333 (YE/RD).

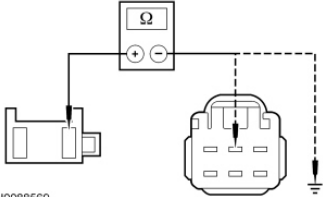
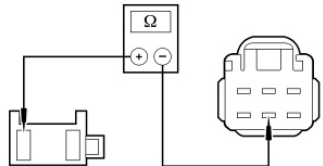
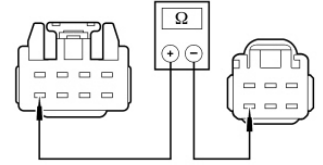
**This pinpoint test is intended to diagnose the following:**

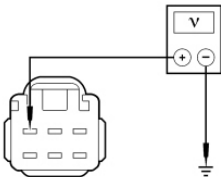
- Wiring, terminals or connectors
- Passenger window motor
- Passenger front window control switch
- Driver window control switch

**PINPOINT TEST C: A SINGLE POWER WINDOW IS INOPERATIVE - PASSENGER FRONT**

Test Step	Result / Action to Take
<b>C1 CHECK THE OPERATION FROM THE DRIVER WINDOW CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Operate the front passenger window from the driver window control switch.</li> <li>• <b>Does the front passenger window operate from the driver window control switch?</b></li> </ul>	<p><b>Yes</b> VERIFY the window lock button is off. If the button is off, GO to <u>C10</u> .</p> <p><b>No</b> GO to <u>C2</u> .</p>
<b>C2 CHECK THE DOWN INPUT TO THE WINDOW MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Front Passenger Window Motor C608.</li> <li>• Ignition ON.</li> <li>• While pressing the driver window control switch to the front passenger down position, measure the voltage between front passenger window motor C608-2, circuit 333 (YE/RD), harness side and ground.</li> </ul> <div> <p>N0013028</p> </div> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>C6</u> .</p> <p><b>No</b> GO to <u>C3</u> .</p>

<b>C3 CHECK THE DOWN INPUT TO THE FRONT PASSENGER WINDOW CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Front Passenger Window Control Switch C624.</li> <li>• While pressing the driver window control switch to the passenger window down position, measure the voltage between front passenger window control switch C624-1, circuit 314 (TN/LB), harness side and ground.</li> </ul>  <p>N0088567</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> GO to <u>C5</u> .</p> <p><b>No</b> GO to <u>C4</u> .</p>
<b>C4 CHECK CIRCUIT 314 (TN/LB) FOR AN OPEN OR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Driver Window Switch C504b.</li> <li>• Measure the resistance between front passenger window control switch C624-1, circuit 314 (TN/LB), harness side and driver window control switch C504b-3, circuit 314 (TN/LB), harness side; and between front passenger window control switch C624-1, circuit 314 (TN/LB), harness side and ground.</li> </ul>  <p>N0088568</p> <p>• Is the resistance less than 5 ohms between the front passenger window control switch and driver window control switch; and greater than 10,000 ohms between the front passenger window control switch and ground?</p>	<p><b>Yes</b> INSTALL a new driver window control switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>C5 CHECK CIRCUIT 333 (YE/RD) FOR AN OPEN OR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between front passenger window motor C608-2, circuit 333 (YE/RD), harness side and front passenger window control switch C624-2, circuit 333 (YE/RD), harness side; and between front passenger window motor C608-2, circuit 333 (YE/RD), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new front passenger window control switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

 <p>N0088569</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the front passenger window motor and front passenger window control switch; and greater than 10,000 ohms between the front passenger window motor and ground?</li> </ul>	
<b>C6 CHECK CIRCUIT 334 (RD/YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Front Passenger Window Control Switch C624.</li> <li>• Measure the resistance between front passenger window motor C608-1, circuit 334 (RD/YE), harness side and front passenger window control switch C624-5, circuit 334 (RD/YE), harness side.</li> </ul>  <p>N0088570</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C7</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>C7 CHECK CIRCUIT 313 (WH/YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Driver Window Control Switch C504b.</li> <li>• Measure the resistance between driver window control switch C504b-8, circuit 313 (WH/YE), harness side and front passenger window control switch C624-6, circuit 313 (WH/YE), harness side.</li> </ul>  <p>N0088571</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>C8 CHECK THE FRONT PASSENGER WINDOW CONTROL SWITCH FOR CORRECT OPERATION</b>	
	<p><b>Yes</b> GO to <u>C9</u> .</p>

<ul style="list-style-type: none"> <li>Carry out the front passenger window control switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li><b>Is the front passenger window control switch OK?</b></li> </ul>	<p><b>No</b> INSTALL a new front passenger window control switch. TEST the system for normal operation.</p>
<b>C9 CHECK THE DRIVER WINDOW CONTROL SWITCH FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>Carry out the driver window control switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li><b>Is the driver window control switch OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new front passenger window regulator and motor. REFER to <u>Window Regulator Motor - Front Door</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new driver window control switch. TEST the system for normal operation.</p>
<b>C10 CHECK CIRCUIT 170 (RD/LB) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Disconnect: Front Passenger Window Control Switch C604.</li> <li>Measure the voltage between front passenger window control switch C624-3, circuit 170 (RD/LB), harness side and ground.</li> </ul>  <p>N0076965</p> <ul style="list-style-type: none"> <li><b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> INSTALL a new front passenger window control switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

### Pinpoint Test D: A Single Power Window is Inoperative - Passenger Rear

Refer to Wiring Diagrams Cell 100 , Power Windows for schematic and connector information.

#### Normal Operation

Voltage is supplied to the left rear and right rear power windows from the driver window control switch through circuit 170 (RD/LB). If the driver window control switch is in the LOCK position, the circuit is open and the windows do not operate from their respective window control switches.

**NOTE:** Police vehicles have additional rear window disable in line connector between the driver window control switch and the RH and LH rear window control switches on circuit 170 (RD/LB). Make sure the window(s) are in the operational position when making measurements.

**LH Rear**

When operating the LH rear window in the down direction, ground is provided from the driver window control switch through circuit 317 (GY/OG). Voltage is supplied to the LH rear window motor through circuit 334 (RD/YE) and ground through circuit 333 (YE/RD).

When operating the LH rear window in the up direction, ground is provided from the driver window control switch through circuit 316 (YE/LB). Voltage is supplied to the LH rear window motor through circuit 333 (YE/RD) and ground through circuit 334 (RD/YE).

When the LH rear power window is operated in the down direction from the driver window control switch, voltage is sent to LH rear window control switch through circuit 316 (YE/LB), which transfers power to the LH rear window motor through circuit 334 (RD/YE). Ground is provided to the LH rear window control switch through circuit 317 (GY/OG), which transfers ground to the LH rear window motor through circuit 333 (YE/RD). When the LH rear window is operated in the up direction from the driver window control switch, voltage is sent to the LH rear window control switch through circuit 317 (GY/OG), which transfers power to the LH rear window motor through circuit 333 (YE/RD). Ground is provided to the LH rear window switch through circuit 316 (YE/LB), which transfers ground to the LH rear window motor through circuit 334 (RD/YE).

**RH Rear**

When operating the RH rear window in the down direction, ground is provided from the driver window control switch through circuit 319 (YE/BK). Voltage is supplied to the right rear window motor through circuit 334 (RD/YE) and ground through circuit 333 (YE/RD).

When operating the right rear window in the up direction, ground is provided from the driver window control switch through circuit 320 (RD/BK). Voltage is supplied to the right rear window motor through circuit 333 (YE/RD) and ground through circuit 334 (RD/YE).

When the right rear power window is operated in the down direction from the driver window control switch, voltage is sent to right rear window control switch through circuit 320 (RD/BK), which transfers power to the right rear window motor through circuit 334 (RD/YE). Ground is provided to the right rear window control switch through circuit 319 (YE/BK), which transfers ground to the right rear window motor through circuit 333 (YE/RD). When the right rear window is operated in the up direction from the driver window control switch, voltage is sent to the right rear window control switch through circuit 319 (YE/BK), which transfers power to the right rear window motor through circuit 333 (YE/RD). Ground is provided to the right rear window switch through circuit 320 (RD/BK), which transfers ground to the right rear window motor through circuit 334 (RD/YE).

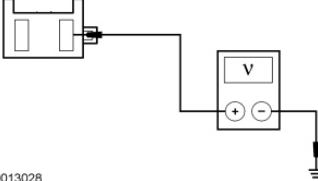
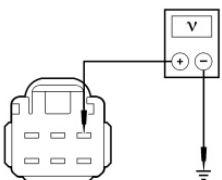
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LH rear passenger window control switch
- RH rear passenger window control switch
- Driver window control switch
- LH rear window regulator motor
- RH rear window regulator motor

**PINPOINT TEST D: A SINGLE POWER WINDOW IS INOPERATIVE - PASSENGER REAR**

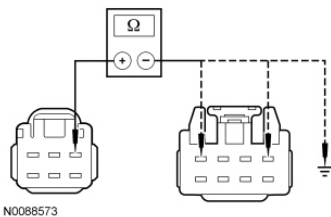
Test Step	Result / Action to Take
<b>D1 CHECK THE OPERATION FROM THE DRIVER WINDOW CONTROL SWITCH</b>	



<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Operate the rear passenger windows from the driver window control switch.</li> <li>• <b>Do the rear passenger windows operate from the driver window control switch?</b></li> </ul>	<p><b>Yes</b> VERIFY the window lock button is OFF. If the button is OFF, GO to <u>D6</u>.</p> <p><b>No</b> GO to <u>D2</u>.</p>
<p><b>D2 CHECK THE DOWN INPUT TO THE REAR PASSENGER WINDOW MOTOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Rear Window Motor C703 (LH), C803 (RH).</li> <li>• Ignition ON.</li> <li>• While pressing the driver window control switch to the inoperative rear window in the down position, measure the voltage between LH rear passenger window motor C703-2 or RH rear passenger window motor C803-2, circuit 333 (YE/RD), harness side and ground.</li> </ul>  <p>N0013028</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>D7</u>.</p> <p><b>No</b> GO to <u>D3</u>.</p>
<p><b>D3 CHECK THE DOWN INPUT TO THE REAR WINDOW CONTROL SWITCH</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Rear Window Control Switch C701 (LH), C801 (RH).</li> <li>• Ignition ON.</li> <li>• While pressing the driver window control switch to the inoperative rear window in the down position, measure the voltage between LH rear passenger window control switch C701-1, circuit 316 (YE/LB) or RH rear passenger window control switch C801-1, circuit 320 (RD/BK), harness side and ground.</li> </ul>  <p>N0088572</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>D5</u>.</p> <p><b>No</b> GO to <u>D4</u>.</p>
<p><b>D4 CHECK CIRCUITS 316 (YE/LB) AND 320 (RD/BK) FOR AN OPEN OR SHORT TO GROUND</b></p>	

- Ignition OFF.
- Disconnect: Driver Window Control Switch C504a.
- Measure the resistance between the inoperative rear window control switch, harness side and the driver window control switch, harness side; and between the inoperative rear window control switch, harness side and ground as follows:

Rear Passenger Door Control Switch Connector - Pin	Circuit	Driver Door Window Control Switch Connector - Pin	Circuit
C701-1 (LH)	316 (YE/LB)	C504a-1	316 (YE/LB)
C801-1 (RH)	320 (RD/BK)	C504a-4	320 (RD/BK)



- Is the resistance less than 5 ohms between the switches; and greater than 10,000 ohms between the switch and ground?

**Yes**

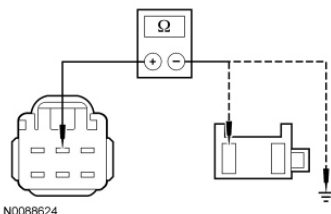
INSTALL a new driver window control switch. TEST the system for normal operation.

**No**

REPAIR the circuit in question. TEST the system for normal operation.

#### D5 CHECK CIRCUIT 334 (RD/YE) FOR AN OPEN OR SHORT TO GROUND

- Measure the resistance between inoperative rear window control switch (LH) C701-2, (RH) C801-2, circuit 334 (RD/YE), harness side and inoperative rear window motor (LH) C703-1, (RH) C803-1, circuit 334 (RD/YE), harness side.



- Is the resistance less than 5 ohms?

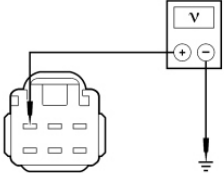
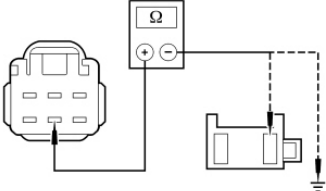
**Yes**

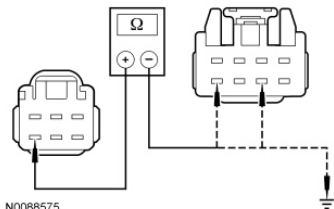
INSTALL a new rear window control switch. TEST the system for normal operation.

**No**

REPAIR the circuit. TEST the system for normal operation.

#### D6 CHECK CIRCUIT 170 (RD/LB) FOR AN OPEN

<p><b>NOTE:</b> Police vehicles have additional rear window disable in line connector between the driver window control switch and the RH and LH rear window control switches on circuit 170 (RD/LB). Make sure the window(s) are in the operational position when making measurements.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Rear Window Control Switch (LH) C701, (RH) C801.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between inoperative rear window control switch (LH) C701-3, (RH) C801-3, circuit 170 (RD/LB), harness side and ground.</li> </ul>  <p>N0076965</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> INSTALL a new rear window control switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>D7 CHECK CIRCUIT 333 (YE/RD) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Rear Window Control Switch (LH) C701, (RH) C801.</li> <li>• Measure the resistance between inoperative rear window control switch (LH) C701-5, (RH) C801-5, circuit 333 (YE/RD), harness side and inoperative rear window motor (LH) C703-2, (RH) C803-2, circuit 333 (YE/RD), harness side; and between inoperative rear window control switch (LH) C701-5, (RH) C801-5, circuit 333 (YE/RD), harness side and ground.</li> </ul>  <p>N0088625</p> <p>• Is the resistance less than 5 ohms between the inoperative switch and motor; and greater than 10,000 ohms between the inoperative switch and ground?</p>	<p><b>Yes</b> GO to <u>D8</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>D8 CHECK CIRCUITS 317 (GY/OG) AND 319 (YE/BK) FOR AN OPEN OR A SHORT TO GROUND</b>	

<ul style="list-style-type: none"><li>• Disconnect: Driver Window Control Switch C504a.</li><li>• Measure the resistance between the inoperative rear window control switch, harness side and the driver window control switch, harness side; and between the inoperative rear window control switch, harness side and ground as follows:</li></ul>		<b>Yes</b> GO to <u>D9</u> .													
		<b>No</b> REPAIR the circuit(s) as necessary. TEST the system for normal operation.													
<table><tr><th>Rear Passenger Door Control Switch Connector - Pin</th><th>Circuit</th><th>Driver Door Window Control Switch Connector - Pin</th><th>Circuit</th></tr><tr><td>C701-6 (LH)</td><td>317 (GY/OG)</td><td>C504a-6</td><td>317 (GY/OG)</td></tr><tr><td>C801-6 (RH)</td><td>319 (YE/BK)</td><td>C504a-8</td><td>319 (YE/BK)</td></tr></table>				Rear Passenger Door Control Switch Connector - Pin	Circuit	Driver Door Window Control Switch Connector - Pin	Circuit	C701-6 (LH)	317 (GY/OG)	C504a-6	317 (GY/OG)	C801-6 (RH)	319 (YE/BK)	C504a-8	319 (YE/BK)
Rear Passenger Door Control Switch Connector - Pin	Circuit	Driver Door Window Control Switch Connector - Pin	Circuit												
C701-6 (LH)	317 (GY/OG)	C504a-6	317 (GY/OG)												
C801-6 (RH)	319 (YE/BK)	C504a-8	319 (YE/BK)												
 <p>N0088575</p> <ul style="list-style-type: none"><li>• Is the resistance less than 5 ohms between the inoperative rear window control switch and driver window control switch; and greater than 10,000 ohms between the inoperative rear window control switch and ground?</li></ul>															
<b>D9 CHECK THE REAR WINDOW CONTROL SWITCH AND DRIVER WINDOW CONTROL SWITCH FOR CORRECT OPERATION</b>															
<ul style="list-style-type: none"><li>• Carry out the inoperative rear window control switch and the driver window control switch component tests.</li></ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"><li>• Do the inoperative rear window control switch and driver window control switch pass the component test?</li></ul>		<b>Yes</b> INSTALL a new rear window motor. REFER to <u>Window Regulator Motor - Rear Door</u> in this section. TEST the system for normal operation.													
		<b>No</b> INSTALL a new window control switch as necessary. TEST the system for normal operation.													

### Pinpoint Test E: The Defrost System is Inoperative

Refer to Wiring Diagrams Cell **56** , Heated Windows for schematic and connector information.

**Normal Operation**

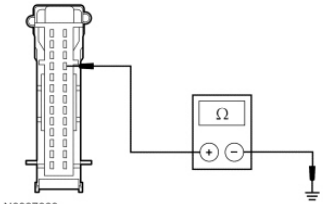
The rear window defrost system is controlled by the Driver Door Module (DDM). The ignition switch must be in RUN for the DDM to operate. When the rear window defrost switch is pressed, the DDM provides a ground for the rear window defrost relay coil through circuit 688 (GY/LB). The rear window defrost relay coil is energized, providing battery voltage to the antenna module on circuit 186 (BN/LB). The antenna module then supplies voltage and ground to the rear window defrost grid.

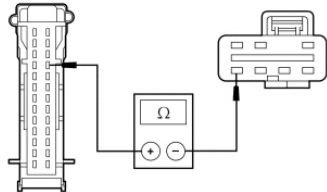
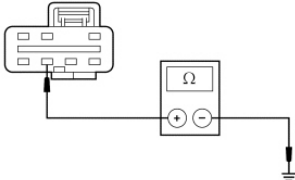
**This pinpoint test is intended to diagnose the following:**

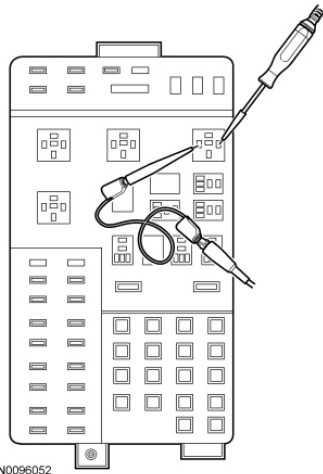
- Fuse
- Wiring, terminals or connectors
- Rear window defrost relay
- Rear window defrost switch
- Rear window defrost grid
- Antenna module
- DDM

**PINPOINT TEST E: THE DEFROST SYSTEM IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>E1 CHECK THE REAR WINDOW DEFROST SWITCH CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• While pressing the rear window defrost switch, measure resistance between DDM C501a-23, circuit 1010 (DB/OG), harness side and ground.</li> </ul>  <p style="text-align: center;">N0027063</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms with the rear window defrost switch pressed?</li> </ul>	<p><b>Yes</b> CONNECT the DDM C501a. GO to <u>E4</u> .</p> <p><b>No</b> GO to <u>E2</u> .</p>
<b>E2 CHECK CIRCUIT 1010 (DB/OG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Rear Window Defrost Switch C241.</li> <li>• Measure the resistance between DDM C501a-23, circuit 1010 (DB/OG), harness side, and rear window defrost switch C241-1, circuit 1010 (DB/OG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>E3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

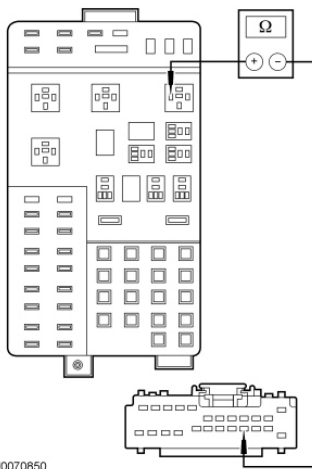
 <p>N0027064</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>E3 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between rear window defrost switch C241-2, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0028365</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new rear window defrost switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>E4 CHECK THE SIGNAL INPUT</b>	
<p><b>NOTICE:</b> Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use the test lamp probe.</p> <ul style="list-style-type: none"> <li>• Disconnect: Rear Window Defrost Relay.</li> <li>• Start the engine.</li> <li>• Press the rear window defrost switch to ON.</li> <li>• Connect a 12-volt incandescent test lamp between rear window defrost relay socket pin 85, circuit 688 (GY/LB) and rear window defrost relay socket pin 86, circuit 185 (BK).</li> </ul>	<p><b>Yes</b> GO to <u>E6</u> .</p> <p><b>No</b> GO to <u>E5</u> .</p>



- Does the test lamp illuminate?

#### E5 CHECK CIRCUIT 688 (GY/LB) FOR AN OPEN

- Ignition OFF.
- Disconnect: DDM 501b.
- Measure the resistance between rear window defrost relay pin 85, circuit 688 (GY/LB), harness side and the DDM C501b-15, circuit 688 (GY/LB), harness side.



- Is the resistance less than 5 ohms?

**Yes**  
GO to E12 .

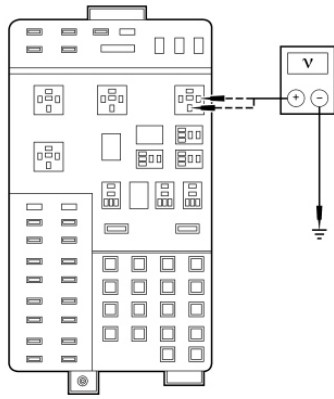
**No**  
REPAIR the circuit. TEST the system for normal operation.

#### E6 CHECK CIRCUIT 185 (BK) FOR VOLTAGE

- Measure the voltage between rear window defrost relay pin 30, circuit 185 (BK), harness side and ground; and between rear window defrost relay pin 86, circuit 185 (BK), harness side and ground.

**Yes**  
GO to E7 .

**No**  
VERIFY the Battery Junction Box (BJB) fuse 107 (40A) is OK. If OK, REPAIR the circuit. TEST the system for normal operation. If not OK, REFER to Wiring Diagrams Manual to identify the possible causes of the circuit short. REPAIR the circuit. TEST the system for normal operation.



N0070851

- Is the voltage greater than 10 volts?

#### E7 CHECK THE REAR WINDOW DEFROST RELAY FOR CORRECT OPERATION

- Carry out the ISO relay component test for the rear window defrost relay.

Refer to Wiring Diagrams Cell 149 for component testing.

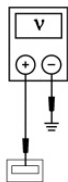
- Is the rear window defrost relay OK?

**Yes**  
GO to E8 .

**No**  
INSTALL a new rear window defrost relay. TEST the system for normal operation.

#### E8 CHECK THE RELAY OUTPUT TO THE HEATED REAR WINDOW GRID

- Ignition OFF.
- Connect: Rear Window Defrost Relay.
- Disconnect: Rear Window Defrost Grid Connector.
- Start the engine.
- Press the rear window defrost switch to on.
- Measure the voltage between rear window defrost grid connector, harness side and ground.



AN1273-A

- Is the voltage greater than 10 volts?

**Yes**  
GO to E11 .

**No**  
GO to E9 .

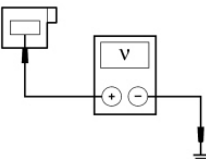
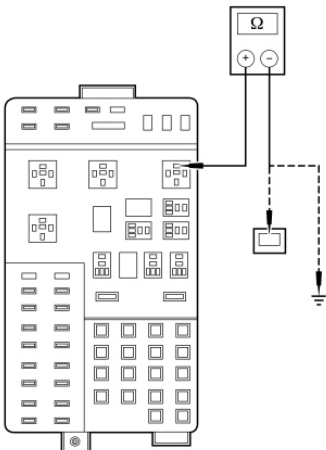
#### E9 CHECK THE RELAY OUTPUT TO THE ANTENNA MODULE

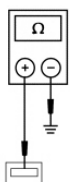
- Ignition OFF.
- Disconnect: Antenna Module C402A.
- Start the engine.
- Press the rear window defrost switch to on.
- Measure the voltage between antenna module C402A-1, circuit 186 (BN/LB), harness side and

**Yes**  
INSTALL a new antenna module. REFER to Section 415-00 . TEST the system for normal operation.

**No**  
GO to E10 .



<p>ground.</p>  <p>A0079579</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<b>E10 CHECK CIRCUIT 186 (BN/LB) FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: BJB Fuse 24 (10A).</li> <li>• Disconnect: Rear Window Defrost Relay.</li> <li>• Measure the resistance between antenna module C402A-1, circuit 186 (BN/LB), harness side and pin 87, circuit 186 (BN/LB), harness side; and between antenna module C402A-1, circuit 186 (BN/LB), harness side and ground.</li> </ul>  <p>N0070852</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the antenna module and the rear window defrost relay; and greater than 10,000 ohms between the antenna module and ground?</li> </ul>	<p><b>Yes</b> INSTALL a new rear window defrost relay. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>E11 CHECK THE GROUND FOR THE HEATED REAR WINDOW GRID</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Rear Window Defrost Grid Ground Connector.</li> <li>• Measure the resistance between rear window defrost grid ground connector, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> CARRY OUT the Grid Wire Test in this section. REPAIR the rear window defrost grid. REFER to <u>Window Grid Wire Repair</u> in this section. TEST the system for normal operation.</p> <p><b>No</b></p>

 <p>AN1274-A</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p>INSTALL a new antenna module. REFER to <u>Section 415-00</u> . TEST the system for normal operation.</p>
<b>E12 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion.</li> <li>♦ pushed-out pins.</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test F: DTC B1349 - Heated Backlite Relay Short to Battery**

Refer to Wiring Diagrams Cell 56 , Heated Windows for schematic and connector information.

**Normal Operation**

The key must be in the START or RUN position for the rear window defrost to operate. When the rear window defrost switch is pressed, a momentary ground is supplied to the Driver Door Module (DDM) through circuit 1010 (DB/OG). The DDM provides a ground for the rear window defrost relay coil on circuit 688 (GY/LB). When the rear window defrost relay coil is energized, the relay switch closes, providing voltage to the rear window defrost grid, the rear window defrost indicator, and the heated exterior mirror (if equipped) through circuit 186 (BN/LB). The rear window defrost grid and the rear window defrost switch are grounded through circuit 57 (BK).

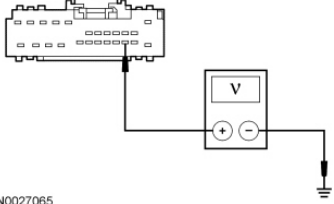
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Rear window defrost relay
- DDM

**PINPOINT TEST F: DTC B1349 - HEATED BACKLIGHT RELAY SHORT TO BATTERY**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>F1 CHECK CIRCUIT 688 (GY/LB) FOR SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Disconnect: DDM C501b.</li> <li>• Disconnect: Rear Window Defrost Relay.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between DDM C501b-15, circuit 688 (GY/LB), harness side and ground.</li> </ul>  <p>N0027065</p> <ul style="list-style-type: none"> <li>• Is there any voltage indicated?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>F2</u> .</p>
<b>F2 CHECK THE REAR WINDOW DEFROST RELAY FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Carry out the ISO relay component test for the rear window defrost relay.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• Is the rear window defrost relay OK?</li> </ul>	<p><b>Yes</b> GO to <u>F3</u> .</p> <p><b>No</b> INSTALL a new rear window defrost relay. CLEAR the DTCs. REPEAT the self-test.</p>
<b>F3 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>

### Pinpoint Test G: The Defrost System Does Not Shut Off Automatically

Refer to Wiring Diagrams Cell 56 , Heated Windows for schematic and connector information.

#### Normal Operation

The key must be in the START or RUN position for the rear window defrost system to operate. When the rear window defrost switch is pressed, a momentary ground is supplied to the Driver Door Module (DDM) through circuit 1010 (DB/OG). The DDM provides a ground for the rear window defrost relay coil on circuit 688 (GY/LB). When the rear window defrost relay coil is energized, the relay switch closes, providing voltage to the rear window defrost grid, the rear window defrost indicator, and the heated exterior mirror (if equipped) through circuit 186 (BN/LB). The rear window defrost grid and the rear window defrost switch are grounded

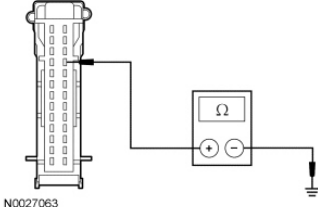
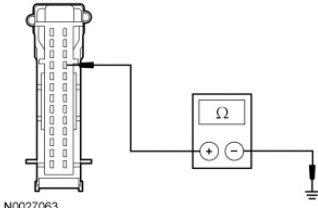
through circuit 57 (BK).

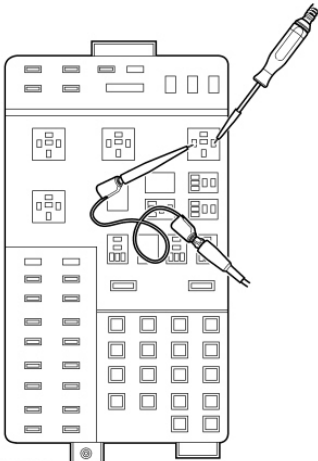
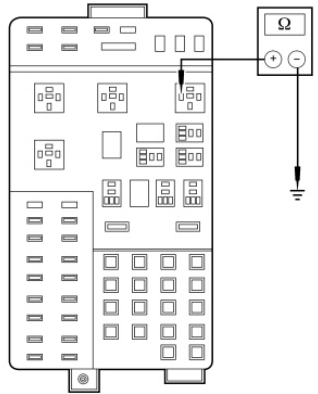
**This pinpoint test is intended to diagnose the following:**

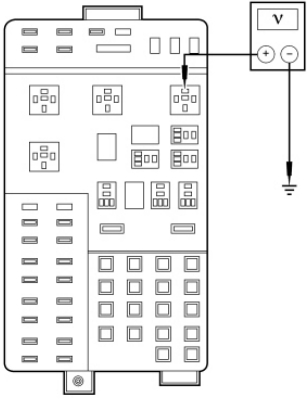
- Wiring, terminals or connectors
- Rear window defrost switch
- Rear window defrost relay
- DDM

**PINPOINT TEST G: THE DEFROST SYSTEM DOES NOT SHUT OFF AUTOMATICALLY**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>G1 CHECK THE REAR WINDOW DEFROST SWITCH CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between DDM C501a-23, circuit 1010 (DB/OG), harness side and ground.</li> </ul>  <p><b>• Is the resistance greater than 10,000 ohms?</b></p>	<p><b>Yes</b> GO to <u>G3</u> .</p> <p><b>No</b> GO to <u>G2</u> .</p>
<b>G2 CHECK HEATED CIRCUIT 1010 (DB/OG) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Rear Window Defrost Switch C241.</li> <li>• Measure the resistance between DDM C501a-23, circuit 1010 (DB/OG), harness side and ground.</li> </ul>  <p><b>• Is the resistance greater than 10,000 ohms?</b></p>	<p><b>Yes</b> INSTALL a new rear window defrost switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>G3 CHECK CIRCUIT 688 (GY/LB) FOR A SHORT TO GROUND</b>	

<p><b>NOTICE:</b> Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use the test lamp probe.</p> <ul style="list-style-type: none"> <li>• Disconnect: Rear Window Defrost Relay.</li> <li>• Connect a 12-volt incandescent test lamp between rear window defrost relay socket pin 85, circuit 688 (GY/LB) and rear window defrost relay socket pin 86, circuit 185 (BK).</li> </ul>  <p>N0096052</p> <p>• Does the test lamp illuminate?</p>	<p><b>Yes</b> GO to <u>G5</u> .</p> <p><b>No</b> GO to <u>G4</u> .</p>
<p><b>G4 CHECK THE DDM FOR A SHORT TO GROUND</b></p> <ul style="list-style-type: none"> <li>• Disconnect: DDM C501b.</li> <li>• Measure the resistance between rear window defrost relay pin 85, circuit 688 (GY/LB), harness side and ground.</li> </ul>  <p>N0070846</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>G7</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>G5 CHECK CIRCUIT 186 (BN/LB) FOR A SHORT TO VOLTAGE</b></p>	

<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between rear window defrost relay pin 87, circuit 186 (BN/LB), harness side and ground.</li> </ul>  <p>N0070853</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>G6</u> .</p>
<b>G6 CHECK THE REAR WINDOW DEFROST RELAY FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Carry out the ISO relay component test for the rear window defrost relay.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• Is the rear window defrost relay OK?</li> </ul>	<p><b>Yes</b> GO to <u>G7</u> .</p> <p><b>No</b> INSTALL a new rear window defrost relay. TEST the system for normal operation.</p>
<b>G7 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion.</li> <li>♦ pushed-out pins.</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test H: The Defrost System is Inoperative - ON Indicator

Refer to Wiring Diagrams Cell 56 , Heated Windows for schematic and connector information.

#### Normal Operation

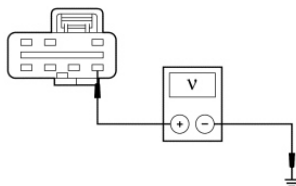
When the rear window defrost relay is energized, switched voltage is supplied to the rear window defrost switch indicator through circuit 59 (DG/VT). The switch is grounded through circuit 57 (BK).

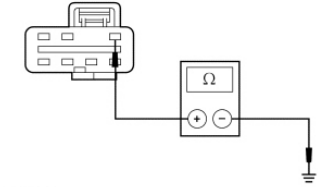
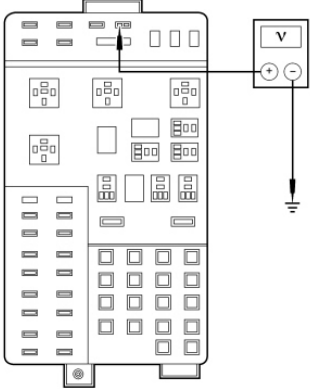
**This pinpoint test is intended to diagnose the following:**

- Fuse

- Wiring, terminals or connectors
- Rear window defrost switch

**PINPOINT TEST H: THE DEFROST SYSTEM IS INOPERATIVE - ON INDICATOR**

Test Step	Result / Action to Take
<b>H1 CHECK THE HEATED REAR WINDOW OPERATION</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Press the rear window defrost switch to ON.</li> <li>• <b>Does the rear window defrost grid operate?</b></li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test E</u> .</p>
<b>H2 CHECK THE VOLTAGE TO THE REAR WINDOW DEFROST SWITCH INDICATOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Rear Window Defrost Switch C241.</li> <li>• Start the engine.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Trigger the DDM PID HEAT_BCK ON.</li> <li>• Measure the voltage between rear window defrost switch C241-4, circuit 59 (DG/VT), harness side and ground.</li> </ul>  <p>A0028367</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>H3</u> .</p> <p><b>No</b> VERIFY the BJB fuse 24 (10A) is OK. If OK, GO to <u>H4</u> . If not OK, REFER to Wiring Diagrams Manual to identify the possible causes of the circuit short. REPAIR the circuit. TEST the system for normal operation.</p>
<b>H3 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between rear window defrost switch C241-7, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new rear window defrost switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

 <p>N0027069</p> <p>• Is the resistance less than 5 ohms?</p>	
<p><b>H4 CHECK CIRCUIT 186 (BN/LB) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: BJB Fuse 24 (10A).</li> <li>• Measure the voltage between input cavity of BJB fuse 24 (10A), circuit 186 (BN/LB) and ground.</li> </ul>  <p>N0070854</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> REPAIR circuit 59 (DG/VT). TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 186 (BN/LB). TEST the system for normal operation.</p>

## Component Tests

### Grid Wire Test

1. Using a bright lamp in the vehicle, inspect the wire grid from the exterior. A broken grid wire appears as a brown spot.
2. Run the engine at idle. Set the heated rear window switch to ON. The indicator light should come on.
3. Working in the vehicle with a voltmeter, contact the broad red-brown stripes of the rear glass window positive lead to battery side and the negative lead to ground side. The meter should read 10-13 volts. A lower voltage reading indicates a loose ground connection.
4. Contact a good ground point with the negative lead of the meter. The voltage reading should not change.
5. With the negative lead of the meter grounded, touch each grid line of the heated rear window glass at its midpoint with the positive lead. A reading of approximately 6 volts indicates the line is good. A reading of 0 volts indicates the line is broken between the midpoint and the B+ side of the grid line. A reading of 12 volts indicates the circuit is broken between the midpoint of the grid line and ground.



6. Pinpointing the exact position of the break can be accomplished (if the voltmeter reads 0 volts when the midpoint of the grid line is touched with the positive lead of the voltmeter) by moving the positive lead of the voltmeter toward the B+ side of the grid line and touching the grid line until the voltmeter reads 12 volts.

If the voltmeter reads 12 volts when the midpoint of the grid line is touched with the positive lead of the voltmeter, simply move the positive lead of the voltmeter toward the ground connection of the grid line and touch the grid line until the voltmeter reads 0 volt.

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**Window Grid Wire Repair**

## General Equipment

Polypropylene Film Fine Line Tape (Commercially available)

## Material

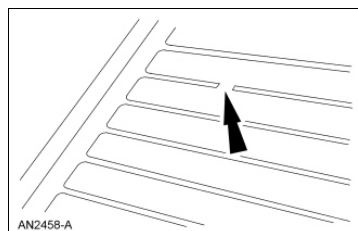
Item	Specification
Lacquer Touch-Up Paint (match color to exterior grid wire) PM-19500-XXXX	ESR-M2P100-C
Rear Window Defroster Repair PM-11 (US); CPM-11 (Canada)	-
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

**NOTE:** The grid line material is not embedded into the glass, but is baked to the glass surface and consequently can be scraped off. An undamaged grid line will have small ridges that project above the surface of the glass and can easily be felt when running a fingernail across them. Grid lines that have been "razor bladed" will feel smooth when a fingernail is dragged across the affected area. Inoperative lines may appear to the eye to be undamaged due to residue remaining on the glass and will require diagnosis with a voltmeter or 12V test lamp. For additional information, refer to Diagnosis and Testing in this section.

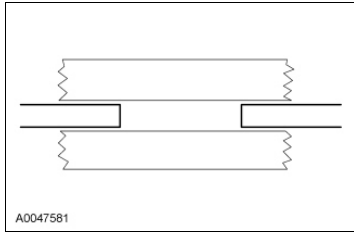
1. Bring the vehicle up to a room temperature of at least 16°C (60°F) or above.
2. **NOTICE: Do not use scrapers, sharp instruments or abrasive window cleaners on the interior surface of the rear window glass as this may cause damage to the grid lines.**

Clean the entire grid line repair area with glass cleaner and 0000 steel wool to remove all dirt, wax, grease, oil or other foreign material.

3. Mark the location of the grid break on the exterior of the rear window glass.



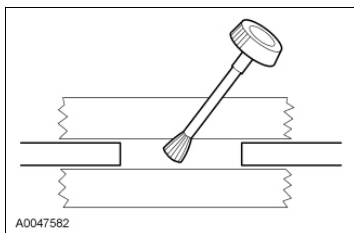
4. Using a polypropylene film fine line tape, mask the area directly above and below the grid break extending the tape 26 mm (1.02 in) beyond the concern area in both directions. The break area should be at the center of the mask.



5. **NOTE:** If the brown layer is not broken or missing, apply only the silver grid repair compound to the break. If both the brown and silver layers of the grid are broken or missing, apply a coating of the lacquer touch up paint across the break in the grid line prior to applying the rear window defroster repair compound. Do not overlap the silver grid line with the paint. Several applications may be necessary to achieve a color match.

**NOTE:** Allow at least 5 minutes of drying time between applications for the touch up paint or the silver repair coating. Applying fewer coats or not allowing adequate drying time between coats will produce repaired resistance that is greater than OEM resistance, resulting in poor defrost performance and excessive localized heating.

Apply the repair coating to the grid break area in several smooth, continuous strokes. Extend the silver repair coating at least 6.35 mm (0.25 in) on both sides of the break area. Apply a minimum of 6 applications of the grid repair compound.



6. **NOTE:** The repair coating air-dries in approximately one minute and can be energized after 5 minutes. Optimum adhesion occurs after approximately 24 hours.

Allow the repair area to dry completely and remove the mask.

7. **NOTICE:** Be careful not to damage the grid line with the razor blade. If this occurs, additional repair may be necessary.

Remove any excess repair compound above or below the grid line with a razor blade.

8. **NOTE:** The interior side of the grid lines are not painted, but due to the silver tarnishing will tend to change the grid to a gold or brown color. The repair area will be bright silver and will also tarnish over time to match the rest of the grid.

Test the system for normal operation.



**Lead Terminal Repair**

## General Equipment

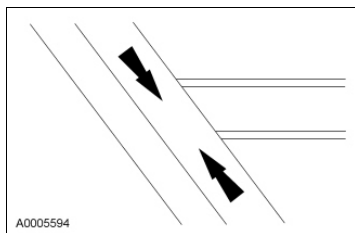
Terminal Kit - Back Glass 4F1Z-14421-AA

## Material

Item	Specification
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

1. Bring the vehicle up to room temperature of at least 16°C (60°F) or above.
2. **NOTE:** The new terminal will cover the original terminal location, but it must be placed so that the terminal conductive areas will be placed on a good conductive base.

Clean the bus bar in the area to be repaired with steel wool (000 to 0000 grade), and then with glass cleaner to remove all dirt, wax, grease, oil or other foreign material.



3. **NOTICE:** Do not use any type of flame torch or flame-heated soldering gun for this procedure. Use of these tools provide inadequate heat generation at the tip and the exhaust heat can cause damage to plastic trim parts in the area. Use only an electric soldering gun with 100 watts or more of power. Before using the soldering gun, be sure to melt a small amount of rosin core solder to the tip. The solder will assist in achieving better heat transfer from the soldering gun tip to the new terminal.

**NOTE:** Depending on the original terminal location, and whether the terminal is covered by pillar trim, will determine where to locate the new terminal. Some grid line bus bars may only allow the placement of the terminal above or below the original tab location due to space limitations. For most vehicle applications, the replacement tab location will cover the original tab location, but still allow the replacement tab to attach to the bus bar on good conductive material.

Place the replacement terminal type A over the original tab location, making sure the conductive areas of the terminal will be on a good conductive area. Do not place the terminal tab foot on the original location, which does not have conductive material.

4. Hold the terminal in place with an item such as a regular lead pencil at a 90 degree angle from the terminal. (Holding at other than a 90 degree angle may allow the terminal to slip when the solder liquefies.)

5. **NOTE:** The new terminal has pre-applied solder, flux and temperature-sensitive paint. The paint provides a visual indication when the terminal has reached the correct temperature to melt solder on the terminal. When the correct temperature is achieved, the temperature paint will liquefy and change color.

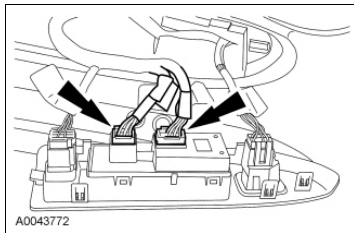
Place the soldering gun tip on the top of the terminal, but not on the painted areas of the tab. Energize the soldering gun and watch for the painted area of the terminal to liquefy and change color. The paint should liquefy in approximately 25-45 seconds after heating. As soon as the paint color completely changes on either side of the terminal, de-energize the soldering gun and continue to hold the terminal in place with the soldering gun and pencil for an additional 30 seconds.

6. Remove the soldering gun and pencil from the terminal. The terminal should be allowed to cool for another 2 minutes before the wiring lead is attached to the terminal.
7. Attach the electrical lead connection to this terminal, turn on the heated rear window and verify the operation.
-

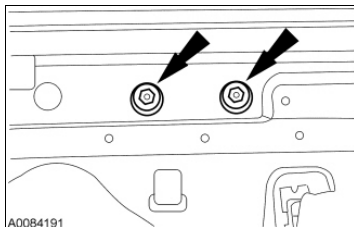
## Window Glass Adjustment

### Front Door Window Glass Adjustment

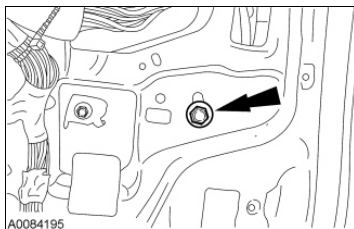
1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
2. Position the watershield aside.
3. Connect the window control switch electrical connectors.



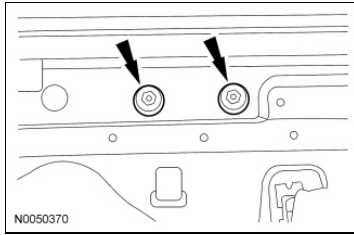
4. Turn the ignition key to the ON position.
5. Partially lower the door glass.
6. Loosen the top regulator nuts a minimum of 3 full threads.



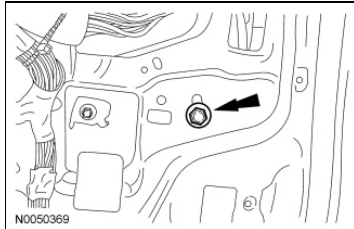
7. Loosen the 2 front door glass top run bolts a minimum of 3 full turns.



8. Cycle the glass to the full down position.
9. Cycle the glass to the full up position.
10. Inspect the window regulator stud location in the slots on the door inner sheet metal panel and make sure the regulator studs are located at the center of the slots.
11. With the regulator studs at the center of the slots, tighten the front door window regulator nuts to 12 Nm (106 lb-in).



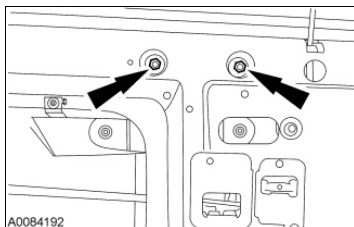
12. Tighten the front door glass run channel bolts to 12 Nm (106 lb-in).



13. Cycle the window glass to verify the window functions correctly.
14. Turn the ignition key to the OFF position.
15. Disconnect the window control switch electrical connectors.
16. Reposition the watershield.
17. Install the front door panel. For additional information, refer to [Section 501-05](#).

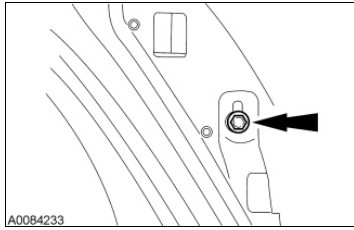
### Rear Door Window Glass Adjustment

1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#).
2. Position the watershield aside.
3. Connect the window control switch electrical connectors.
4. Turn the ignition key to the ON position.
5. Partially lower the door glass.
6. Loosen the top regulator nuts a minimum of 3 full threads.

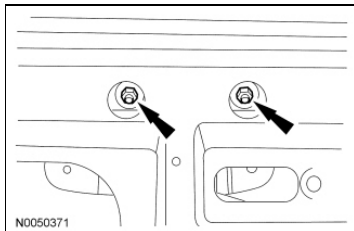


7. Loosen the 2 rear door glass run bolts a minimum of 3 full threads.

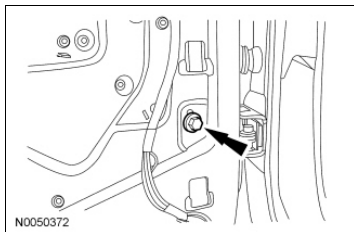




8. Cycle the glass to the full down position.
9. Cycle the glass to the full up position.
10. Inspect the window regulator stud location in the slots on the door inner sheet metal panel and make sure the regulator studs are located at the center of the slots.
11. With the regulator studs at the center of the slots, tighten the rear door window regulator nuts to 6 Nm (53 lb-in).



12. Tighten the rear door glass run channel bolts to 10 Nm (89 lb-in).



13. Verify that the glass is in the correct position. For additional information, refer to Window Glass - Rear Quarter in this section.
  14. Cycle the window glass to verify the window functions correctly.
  15. Turn the ignition key to the OFF position.
  16. Disconnect the window control switch electrical connectors.
  17. Reposition the watershield.
  18. Install the rear door panel. For additional information, refer to Section 501-05.
-

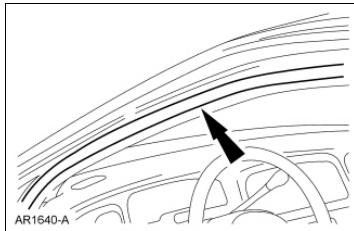


**Glass Reseal - Windshield**

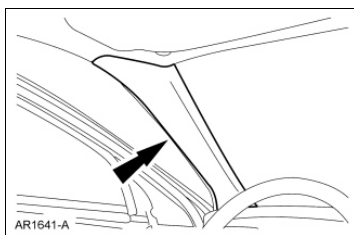
## Material

Item	Specification
Dow Urethane Adhesive Betaseal® Express	-
Sika Urethane Adhesive Sika Tack ASAP	-
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

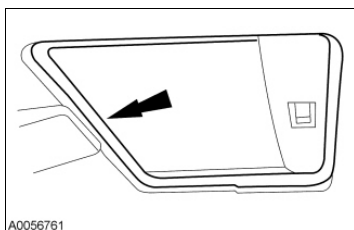
1. Remove the cowl panel grille. For additional information, refer to [Section 501-02](#) .
2. Remove the screws and LH and RH sun visors and clips.
3. Position the LH and RH front door weatherstrips aside.



4. Remove the LH and RH A-pillar trim panels.

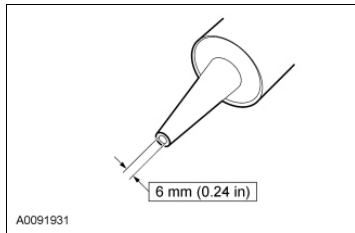


5. If equipped, remove the overhead console. For additional information, refer to [Section 501-12](#) .
6. If equipped, remove the roof opening panel headliner retainer.



7. Partially lower the front portion of the headliner and block with a suitable material.

8. Clean the edge formed by the existing urethane adhesive and the glass on the inside at the top and sides and outside on the bottom of the windshield with glass cleaner.
9. Cut the urethane adhesive applicator tip to specification.



10. **NOTE:** Use either a high ratio, electric or battery-operated caulk gun that applies the urethane adhesive with less effort and continuous bead.

**NOTE:** Make sure that all gaps in the urethane adhesive are smoothed into one continuous bead.

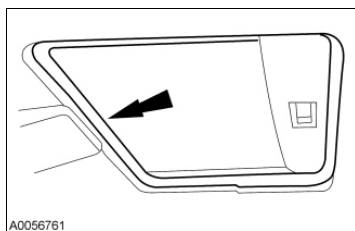
Apply the urethane adhesive over the top of the existing urethane adhesive.

- Apply the urethane adhesive to the top and sides of the windshield from the interior of the vehicle.
- Apply the urethane adhesive to the bottom of the windshield from the exterior of the vehicle.

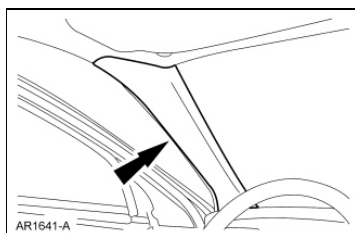
11. **NOTE:** The urethane adhesive must cure for a minimum of one hour before testing for air or water leaks.

After the urethane adhesive cures, check the windshield seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

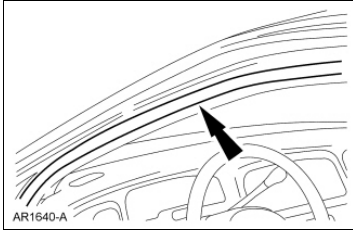
12. Install the front portion of the headliner.
13. If equipped, install the roof opening panel headliner retainer.



14. If equipped, install the overhead console. For additional information, refer to [Section 501-12](#).
15. Install the LH and RH A-pillar trim panels.



16. Install the LH and RH front door weatherstrips.



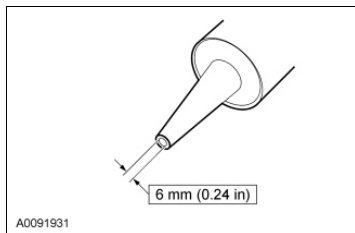
17. Install the LH and RH sun visors and clips.
  18. Install the cowl panel grille. For additional information, refer to [Section 501-02](#) .
  19. Clean the exterior and interior of the windshield glass with glass cleaner.
-

**Glass Reseal - Rear**

## Material

Item	Specification
Dow Urethane Adhesive Betaseal® Express	-
Sika Urethane Adhesive Sika Tack ASAP	-
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

1. Remove the package tray trim panel. For additional information, refer to [Section 501-05](#).
2. Disconnect the rear window glass electrical connectors.
3. Clean the interior and exterior of the windshield glass surface with glass cleaner.
4. Cut the urethane adhesive applicator tip to specification.



5. **NOTE:** Use either a high ratio, electric or battery-operated caulk gun that applies the urethane adhesive with less effort and continuous bead.

**NOTE:** Make sure that all gaps in the urethane adhesive are smoothed into one continuous bead.

Apply the urethane adhesive over the top of the existing urethane adhesive.

- Apply the urethane adhesive to the top and sides of the rear glass from the interior of the vehicle.
- Apply the urethane adhesive to the bottom of the rear glass from the exterior of the vehicle.

6. **NOTE:** The urethane adhesive must cure for a minimum of one hour before testing for air or water leaks.

After the urethane adhesive cures, check the rear glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

7. Connect the rear window glass electrical connectors.
8. Install the package tray trim panel. For additional information, refer to [Section 501-05](#).





SECTION 501-11: Glass, Frames and  
Mechanisms  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual

Procedure revision date: 08/19/2009

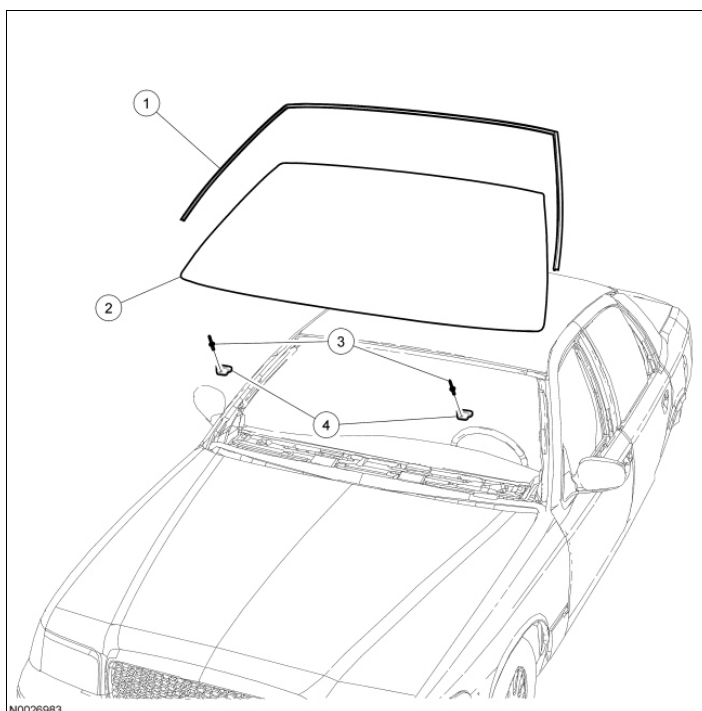
## Windshield Glass

### Special Tool(s)

 ST1320-A	Deluxe Windshield Removal Tool 164-R2450 or equivalent
 ST2085-A	The Pumper 164-R2459 or equivalent

### Material

Item	Specification
Dow Urethane Adhesive Betaseal® Express	-
Dow Urethane One Step Glass Primer Betaprime® 5500 / 5500A / 5500SA	-
Sika Urethane Adhesive Sika Tack ASAP	-
Sika Urethane Metal and Glass Primer Sika 206 G+P	-
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

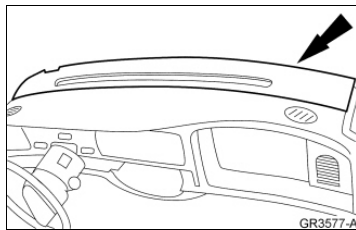




Item	Part Number	Description
1	03144	Windshield moulding
2	03100	Windshield glass
3	381500	Windshield stop rivets (2 required)
4	03296	Windshield stops (2 required)

**Removal**

1. Remove the cowl panel grille. For additional information, refer to [Section 501-02](#) .
2. Remove the sun visors and clips.
3. Remove the RH and LH A-pillar trim panels.
4. Remove the instrument panel defroster opening grille.
  - If equipped, disconnect the electrical connectors.



5. Cover the defroster openings with tape to prevent contaminants from entering the defroster housing.
  6. Remove the interior rear view mirror. For additional information, refer to [Section 501-09](#) .
  7. If equipped, remove the overhead console. For additional information, refer to [Section 501-12](#) .
  8. Lower the front portion of the headliner.
  9. Cover the seats, instrument panel and hood to prevent possible damage.
  10. Before cutting the urethane adhesive, remove dirt and other foreign material from the windshield pinch weld area.
    - Use a clean shop towel or oil-free compressed air.
  11. **NOTE:** Refer to manufacturer's instructions before using the Deluxe Windshield Removal Tool.
- Lubricate the urethane adhesive with water to aid the Deluxe Windshield Removal Tool when cutting the urethane adhesive.
12. **⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.

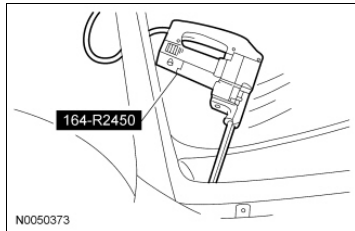
**NOTICE:** To avoid rust formation, use extreme care not to scratch the paint or primer, or otherwise damage the pinch weld during glass removal.

**NOTE:** Insert the blade into the Deluxe Windshield Removal Tool so that the flat side is against the glass. This will leave the entire urethane adhesive bead on the pinch weld and allow a dry fit of the

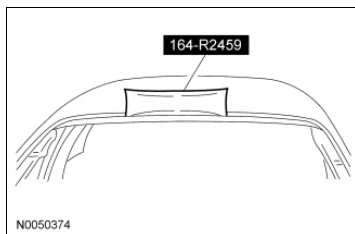
replacement windshield glass.

**NOTE:** Support the windshield glass as necessary to prevent the glass from dropping while cutting the urethane adhesive.

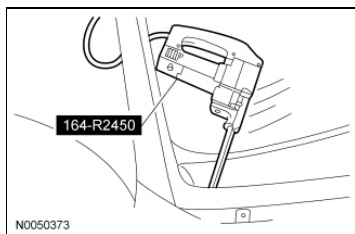
Insert the Deluxe Windshield Removal Tool at the upper center of the windshield glass and work toward the bottom corners.



13. Using The Pumper, distance the windshield glass from the body.



14. Using the Deluxe Windshield Removal Tool, cut the remaining urethane adhesive and remove the windshield glass.



15. Carefully remove the windshield glass from the vehicle and place on a stable work surface.

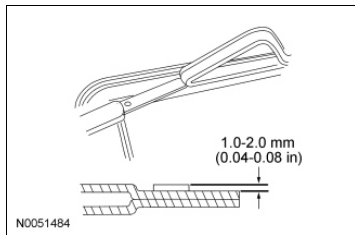
## Installation

1. Dry-fit the new windshield glass on the existing urethane adhesive bead on the pinch weld.
  - Position the windshield glass on the pinch weld.
  - Center the windshield glass in the opening.
  - Adjust the windshield glass stop blocks (if equipped) as needed for best fit.
  - Make alignment marks with tape or non-staining grease pencil (preferably at the windshield glass stop blocks if equipped) on the windshield glass and the body.
2. After the dry-fit alignment, remove the glass from the windshield opening and place on a stable work surface with the interior side of the glass facing up.
3. Using a clean shop towel, brush or oil-free compressed air, clean the pinch weld area around the existing urethane adhesive. Remove any foreign material or water that may have entered during windshield removal.

4. **⚠ WARNING:** Repair any corrosion found on the pinch weld. The pinch weld is a structural component of the vehicle. Corrosion left unrepaired may reduce the structural integrity of the vehicle. Failure to follow this instruction may result in serious injury to vehicle occupant(s).

**NOTE:** Avoid scratching the pinch weld. Repair all minor scratches or exposed metal on the pinch weld, following manufacturer's instructions. Use the same brand pinch weld primer, glass primer and urethane adhesive.

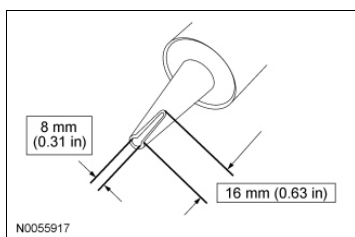
Using an appropriate tool, trim the urethane adhesive leaving a 1-2 mm (0.04-0.08 in) in base of original equipment urethane adhesive on the pinch weld.



5. If reinstalling the same windshield glass, remove the remaining urethane adhesive from the glass leaving a thin layer to bond with the new urethane adhesive bead.
6. Clean the inside of the new windshield glass with glass cleaner.
7. **NOTE:** Be sure to use the same brand and cure-rate products for the urethane adhesive and glass primer. Do not mix different brands of urethane adhesive and glass primer. Refer to the Material Chart in this procedure.

If installing a new windshield glass, apply glass primer according to manufacturer's instructions. Allow at least 6 minutes to dry.

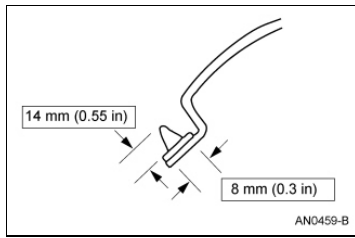
8. Cut the urethane adhesive applicator tip to specification.



9. **NOTE:** The windshield glass must be positioned within 10 minutes of applying the urethane adhesive.

**NOTE:** Use either a high-ratio, electric or battery-operated caulk gun that applies the urethane adhesive with less effort and a continuous bead.

Apply a bead of urethane adhesive on top of the existing trimmed urethane adhesive bead on the pinch weld, starting and ending at the bottom of the windshield near the center, making sure there are no gaps in the bead.



10. **⚠ WARNING:** Do not drive vehicle until the urethane adhesive seal has cured. Follow urethane adhesive manufacturer's curing directions. Inadequate or incorrect curing of the urethane adhesive seal will adversely affect glass retention. Failure to follow these instructions may result in serious injury to vehicle occupant(s).

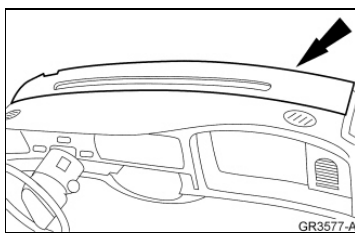
**NOTICE:** Before positioning the windshield glass, open vehicle windows to prevent the air pressure of closing doors from affecting the adhesive bond.

Using the alignment marks made previously, position the windshield glass on the pinch weld.

11. **NOTE:** The urethane adhesive must cure for a minimum of one hour before testing for air or water leaks.

After the urethane adhesive cures, check the windshield glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

12. Install the front portion of the headliner.
13. Install the interior rear view mirror. For additional information, refer to [Section 501-09](#).
14. If equipped, install the overhead console. For additional information, refer to [Section 501-12](#).
15. Remove the tape from the defroster housing.
16. Install the instrument panel defroster opening grille assembly.
- If equipped, connect the electrical connectors.



17. Install the RH and LH A-pillar trim panels.
18. Install the sun visors and clips.
19. Install the cowl panel grille. For additional information, refer to [Section 501-02](#).

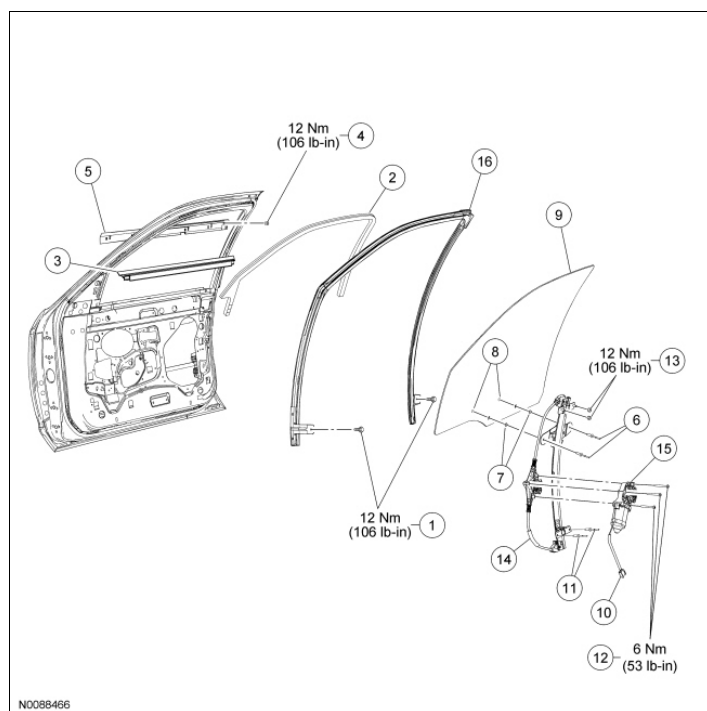


SECTION 501-11: Glass, Frames and  
Mechanisms  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

### Glass, Frames and Mechanisms - Exploded View, Front Door

**NOTE:** RH front door shown, LH front door similar.




Item	Part Number	Description
1	N800510	Front door glass top run bolts (2 required)
2	20890 RH/ 20891 LH	Front door window interior garnish moulding
3	21456 RH/ 21455 LH	Inside weatherstrip
4	N805296	Outside weatherstrip nut
5	21452 RH/ 21451 LH	Outside weatherstrip
6	N811209	Front door window glass rivets (2 required)
7	234A44 RH/ 234A45 LH	Inner spacers (2 required each side)
8	234A46 RH/ 234A47 LH	Outer spacers (2 required each side)
9	21410 RH/ 21411 LH	Front door window glass
10	-	Front door window regulator motor electrical connector (part of 14A005)
11	N802034	Front door window regulator rivets (2 required)
12	N808890	Front door window regulator motor bolts (3 required)
13	N621906	Front door window regulator nuts (2 required)

14	23208 RH/ 23209 LH	Front door window regulator
15	23394 RH/ 23395 LH	Front door window regulator motor
16	21596 RH/ 21597 LH	Front door glass top run

1. For additional information, refer to the procedures in this section.
-

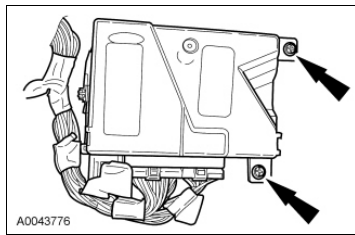
**Window Glass - Front Door**

## Special Tool(s)

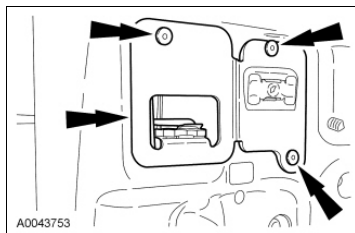
	Heavy Duty Riveter 501-D011 (D80L-23200-A) or equivalent
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**Removal and Installation**

1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#) .
2. Remove the speaker. For additional information, refer to [Section 415-00](#) .
3. Remove the screws and position the Driver Door Module (DDM) aside.



4. Position the upper and lower water shields aside.
5. Remove the rivets and position the door latch remote control aside.



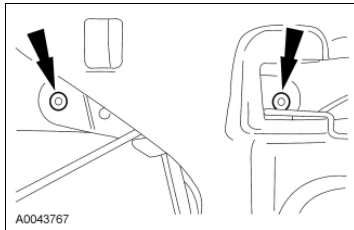
6. Remove the 2 front door glass top run bolts.
  - To install, tighten to 12 Nm (106 lb-in).
7. Remove the inner belt line moulding.
8. Remove the nut and outer belt line moulding.
  - To install, tighten to 12 Nm (106 lb-in).
9. Position the front door glass run front retainer forward.
10. Connect the window control switch electrical connectors.
11. Lower the front door window glass to gain access to the rivets.



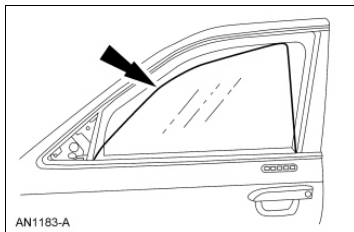
12. **NOTICE:** Do not attempt to forcibly remove the rivets as damage to the front door window glass will result.

**NOTE:** Before removing rivets, it is necessary to place a suitable block support between the front door window channel bracket and the door outer panel to help stabilize the front door window bracket during rivet removal.

Remove the 2 rivets.



13. Remove the front door window glass.



14. **NOTE:** If necessary, align the front door window glass with the front door window channel bracket.


To install, reverse the removal procedure.

- Using the Heavy Duty Riveter, install the 2 spacers and two 1/4 inch rivets (use of 1/4 - 20 x 1 inch screw and washer assemblies and 1/4 inch - 20 nut and washer are optional). Tighten the nut (if used) to 13 Nm (115 lb-in).



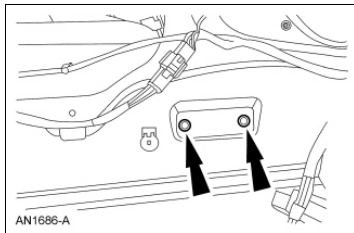
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**Window Regulator and Motor - Front Door****Special Tool(s)**

 ST1132-A	Heavy Duty Riveter 501-D011 (D80L-23200-A) or equivalent
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**Removal and Installation**

1. Remove the front door window glass. For additional information, refer to Window Glass - Front Door in this section.
2. Disconnect the front door window regulator motor electrical connector.
3. Remove the 2 front door window regulator rivets.



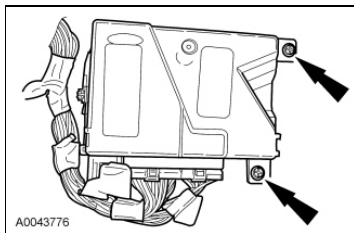
4. Remove the 3 front door window regulator motor bolts.
    - To install, tighten to 6 Nm (53 lb-in).
  5. Remove the 2 front door window regulator nuts.
    - To install, tighten to 12 Nm (106 lb-in).
  6. Remove the front door window regulator.
  7. To install, reverse the removal procedure.
    - Use the Heavy Duty Riveter to install the new rivets.
-



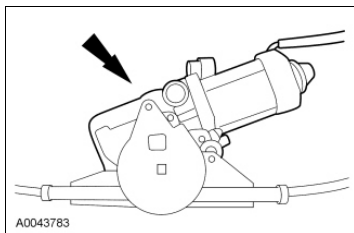
## Window Regulator Motor - Front Door

### Removal and Installation

1. Position the front door window glass in the full up position and secure with tape.
2. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
3. Remove the speaker. For additional information, refer to [Section 415-00](#).
4. Remove the 2 screws and position the Driver Door Module (DDM) aside.



5. Position the upper and lower watershields aside.
6. Disconnect the front door window regulator motor electrical connector.
7. Remove the 3 front door window regulator motor bolts.
  - To install, tighten to 6 Nm (53 lb-in).
8. Partially separate the window motor from the regulator, then press the release tab on the regulator and remove the window regulator motor.



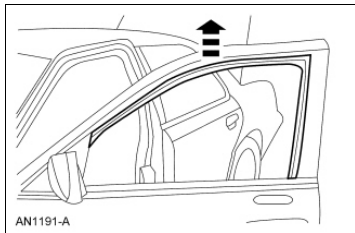
9. To install, reverse the removal procedure.



## Door Glass Top Run - Front

### Removal and Installation

1. Remove the front door window glass. For additional information, refer to Window Glass - Front Door in this section.
2. Remove the front door window interior garnish moulding.
3. Remove the front door glass top run.



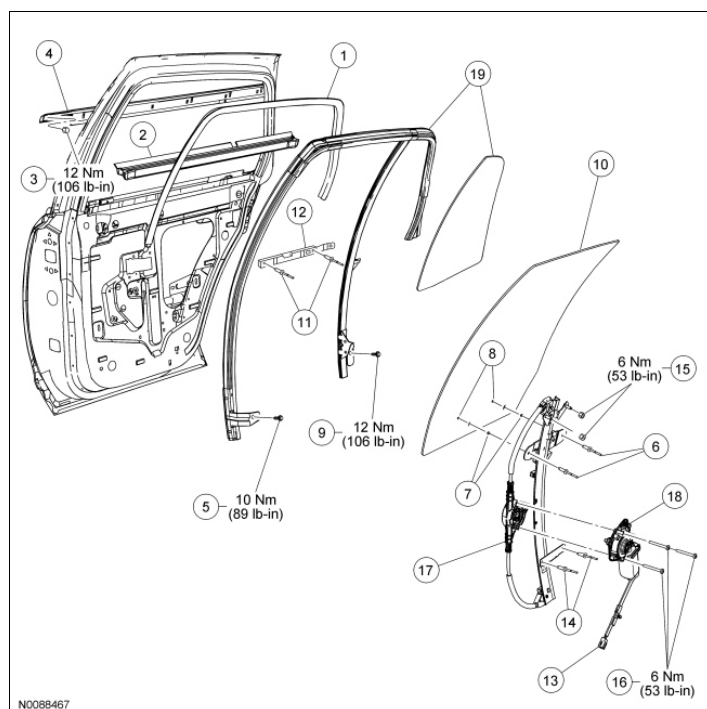
4. To install, reverse the removal procedure.
-

SECTION 501-11: Glass, Frames and  
Mechanisms  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

### Glass, Frames and Mechanisms - Exploded View, Rear Door

**NOTE:** RH rear door shown, LH rear door similar.



Item	Part Number	Description
1	25560 RH/ 25561 LH	Rear door window interior garnish moulding
2	25860 RH/ 25861 LH	Inner belt line moulding
3	N805296	Outer belt line moulding nut
4	25596 RH/ 25595 LH	Outer belt line moulding
5	N800510	Rear door glass top run inner bolt
6	W525175	Rear door window glass rivets (2 required)
7	234A44 RH/ 234A45 LH	Inner spacers (2 required)
8	234A46 RH/ 234A47 LH	Outer spacers (2 required)
9	N800510	Rear door glass top run outer bolt
10	25712 RH/ 25713 LH	Rear door window glass
11	W525172	Pull handle retainer bracket rivets (2 required)
12	22670	Pull handle retainer bracket
13	-	Rear door window regulator motor electrical connector (part of 14A005)
14	W525172	Rear door window regulator rivets (2 required)




		required)
15	N621906	Rear door window regulator nuts (2 required)
16	N808890	Rear door window regulator motor bolts (3 required)
17	27008 RH/ 27007 LH	Rear door window regulator
18	223396 RH/ 223395 LH	Rear door window regulator motor
19	26870	Rear door quarter glass and top run assembly

1. For additional information, refer to the procedures in this section.
-

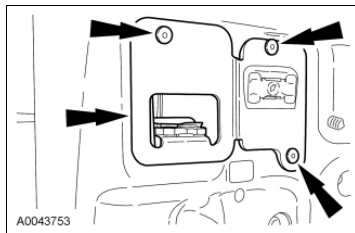
**Window Glass - Rear Door**

## Special Tool(s)

 ST1132-A	Heavy Duty Riveter 501-D011 (D80L-23200-A) or equivalent
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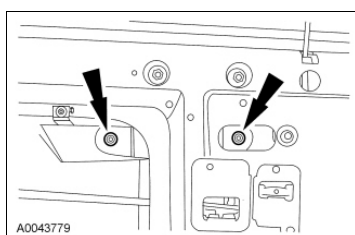
**Removal and Installation**

1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#).
2. Position the watershields aside.
3. Remove the 3 rivets and position the rear door latch remote control aside.

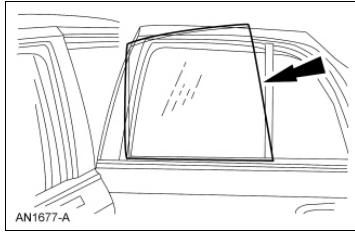


4. Remove the inner belt line moulding.
5. Remove the nut and outer belt line moulding.
  - To install, tighten to 12 Nm (106 lb-in).
6. Remove the rear door glass top run inner bolt.
  - To install, tighten to 10 Nm (89 lb-in).
7. Connect the window control switch electrical connectors.
8. Lower the rear door window glass to gain access to the rivets.
9. **NOTICE:** Do not attempt to forcibly remove the rivets as damage to the rear door window glass may result. Prior to removing the rivet center pins, it is necessary to place a suitable block support between the door outer panel and the rear door window channel bracket to stabilize the rear door window glass during rivet removal.

Remove the 2 rear door window regulator rivets.



10. Remove the rear door glass top run outer bolt.
  - To install, tighten to 12 Nm (106 lb-in).
11. Remove the rear door window glass.




12. **NOTE:** If necessary, align the rear door window glass with the rear door window channel bracket.

To install, reverse the removal procedure.

- Using the Heavy Duty Riveter, install 2 spacers and two 1/4 inch rivets (use of 1/4 - 20 x 1 inch screw and washer assemblies and 1/4 inch - 20 nut and washer are optional). Tighten the nut (if used) to 13 Nm (115 lb-in).
-

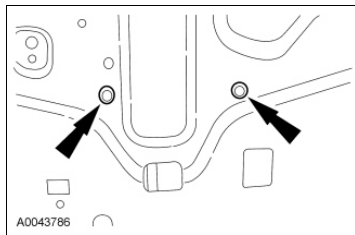
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**Window Regulator and Motor - Rear Door****Special Tool(s)**

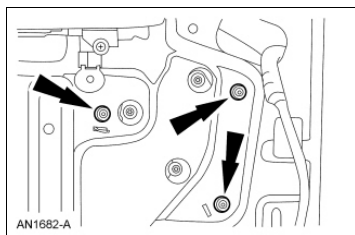
 ST1132-A	Heavy Duty Riveter 501-D011 (D80L-23200-A) or equivalent
---	---

**Removal and Installation**

1. Remove the rear door window glass. For additional information, refer to Window Glass - Rear Door in this section.
2. Remove the 2 rivets and the pull handle retainer bracket.
3. Disconnect the rear door window regulator motor electrical connector.
4. Remove the 2 rear door window regulator rivets.



5. Remove the 2 rear door window regulator nuts.
  - To install, tighten to 6 Nm (53 lb-in).
6. Remove the 3 rear door window regulator motor bolts and the rear door window regulator.
  - To install, tighten to 6 Nm (53 lb-in).




7. To install, reverse the removal procedure.
  - Use the Heavy Duty Riveter to install the rivets.



---

**Window Regulator Motor - Rear Door**

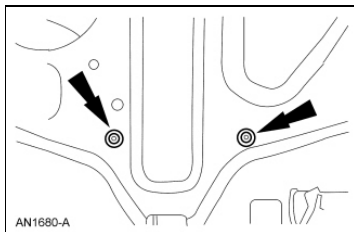
## Special Tool(s)

 ST1132-A	Heavy Duty Riveter 501-D011 (D80L-23200-A) or equivalent
---	---

**Removal and Installation**

1. Position the rear door window glass in the full up position and secure with tape.
2. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#) .
3. Remove the 2 rivets and the pull handle retainer bracket.
4. Position the water shield aside.
5. Disconnect the rear door window regulator motor electrical connector.
6. **NOTE:** Use care not to enlarge the sheet metal holes in the door inner panel.

Remove the 2 rear door window regulator rivets.



7. **NOTE:** Working through the access hole, remove the window regulator motor bracket from the inner panel and slide the motor back to gain access to the screws.

Remove the 3 rear door window regulator motor bolts.

- To install, tighten to 6 Nm (53 lb-in).
8. Separate the window regulator motor from the window regulator and remove it from the rear door.
  9. To install, reverse the removal procedure.
    - Use the Heavy Duty Riveter to install the new rivets.
-



## Window Glass - Rear Quarter

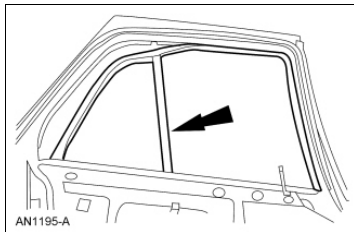
### Removal

1. Remove the rear door window glass. For additional information, refer to Window Glass - Rear Door in this section.
2. **NOTE:** If the rear door window garnish moulding becomes kinked, it is no longer usable and a new moulding must be installed.

Remove the rear door window interior garnish moulding.

3. **NOTE:** Pull the quarter glass forward to loosen the rear door top glass run assembly.

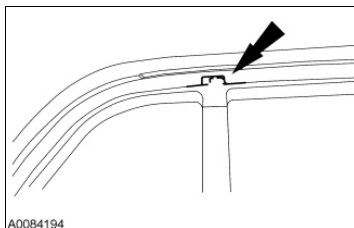
Remove the rear door top glass run and quarter window glass as an assembly.



### Installation

1. **NOTE:** Make sure to install the quarter window glass into the glass channel.

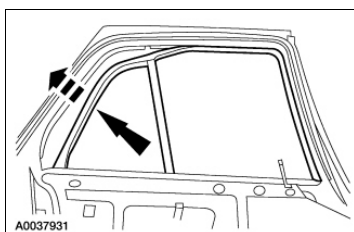
Position the quarter glass into the door frame.



2. **NOTE:** For correct rear door glass fit and function, the glass run division bar locator must be fully forward in the rear door header notch.

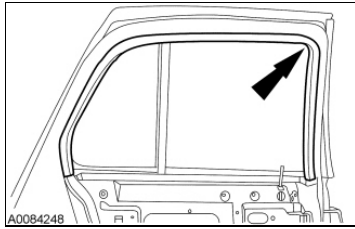
Install the window division bar.

3. Push the run firmly into the C-pillar flange.

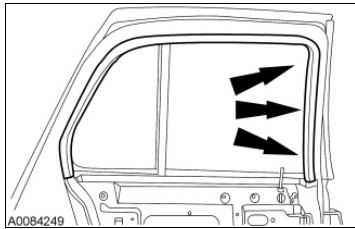




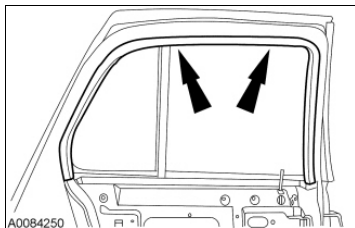
4. Install the run at the B-pillar upper corner.



5. Push the run into the B-pillar flange.



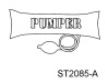

6. Push the run into the header of the door.



7. Install the side glass into the glass run. For additional information, refer to Window Glass - Rear Door in this section.
-

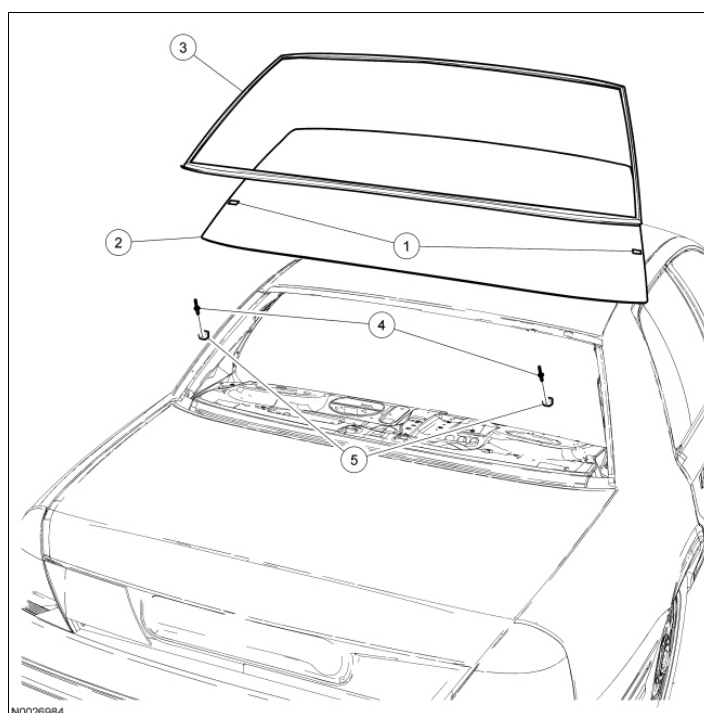
**Window Glass - Rear**

## Special Tool(s)

	The Pumper 164-R2459 or equivalent
	Deluxe Windshield Removal Tool 164-R2450 or equivalent

## Material

Item	Specification
Dow Urethane Adhesive Betaseal® Express	-
Dow Urethane One Step Glass Primer Betaprime® 5500 / 5500A / 5500SA	-
Sika Urethane Adhesive Sika Tack ASAP	-
Sika Urethane Metal and Glass Primer Sika 206 G+P	-
Ultra-Clear Spray Glass Cleaner ZC-23	ESR-M14P5-A

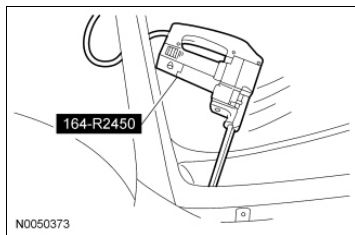


Item	Part Number	Description
1	-	Rear window glass electrical connectors (part of 14A005)
2	42006	Rear window glass
3	42404	Rear window glass moulding
4	N805227	Rear window glass rivets (2 required)
5	42308	Rear window glass stops (2 required)

**Removal**

1. Remove the package tray trim panel. For additional information, refer to [Section 501-05](#).
2. Disconnect the rear window glass electrical connectors.
3. Using a soft brush or vacuum, clean any dirt or foreign material from the pinch weld.
4. **NOTE:** Refer to manufacturer's instructions before using the Deluxe Windshield Removal Tool.

Lubricate the existing urethane adhesive with water using a spray bottle to aid the Deluxe Windshield Removal Tool while cutting.



5. **⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.

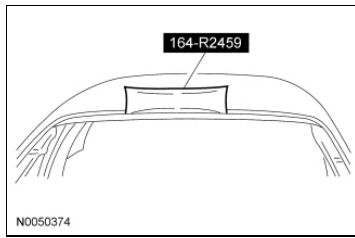
**NOTICE:** To avoid rust formation, use extreme care not to scratch the paint or primer or otherwise damage the pinch weld during glass removal.

**NOTE:** Insert the blade into the Deluxe Windshield Removal Tool so that the flat side is against the glass. This will leave the entire urethane adhesive bead on the pinch weld and allow a dry fit of the replacement rear glass.

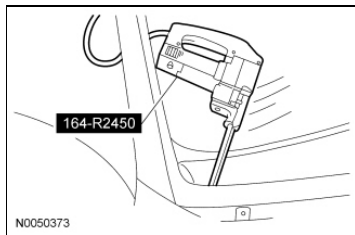
**NOTE:** Support the rear glass as necessary to prevent the glass from dropping while cutting the urethane adhesive.

Using the Deluxe Windshield Removal Tool, starting at the top center of the rear window glass, cut the urethane adhesive from the glass and work down the sides.

6. Using The Pumper, distance the rear window glass from the body.



7. Using the Deluxe Windshield Removal Tool, cut the remaining urethane adhesive and remove the rear window glass



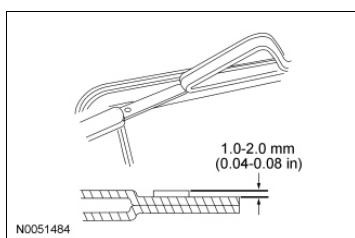
## Installation

**NOTE:** For additional material guidelines, refer to the manufacturer's installation information.

1. Dry-fit the rear window glass by centering it side-to-side and by adjusting the blocks (if equipped) to get the correct position of the part top-to-bottom. Make alignment marks with tape or non-staining grease pencil on both the glass and the vehicle body.
2. **⚠ WARNING: Repair any corrosion found on the pinch weld. The pinch weld is a structural component of the vehicle. Corrosion left unrepaired may reduce the structural integrity of the vehicle. Failure to follow this instruction may result in serious injury to vehicle occupant(s).**

**NOTE:** Avoid scratching the pinch weld. Repair all minor scratches or exposed metal on the pinch weld following manufacturer's instructions. Use the same brand pinch weld primer, glass primer and urethane adhesive.

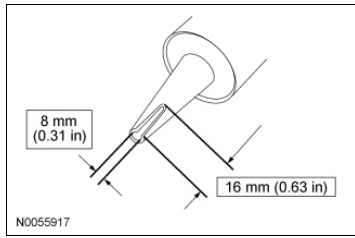
Using an appropriate tool, trim the urethane adhesive leaving a 1-2 mm (0.04-0.08 in) base of original equipment urethane adhesive on the pinch weld.



3. If reinstalling the original rear window glass, remove any excess urethane adhesive from the glass.
4. If installing a new rear window glass, clean the inside of the glass surface with glass cleaner to make sure the ceramic-coated area is clean.
5. **NOTE:** Be sure to use the same brand of cure-rate products for the urethane adhesive and glass primer. Do not mix different brands of urethane adhesive and glass primer. Refer to the Material Chart in the procedure.

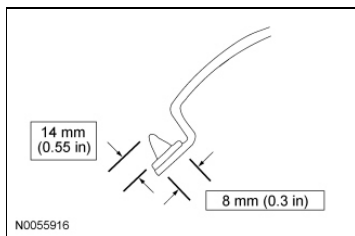
If installing a new rear window glass, apply glass primer according to the manufacturer's instructions. Allow at least 6 minutes to dry.

6. Cut the urethane adhesive applicator tip to specification.



7. **NOTE:** Use either a high-ratio, electric or battery-operated caulk gun that applies the urethane adhesive with less effort and a continuous bead.

Apply urethane adhesive on top of the existing urethane adhesive bead on the pinch weld, starting and ending at the bottom of the rear window glass near the center, making sure there are no gaps in the bead.



8. **NOTICE:** Before positioning the rear window glass, open vehicle windows to prevent the air pressure or closing doors from affecting the urethane adhesive bond.

Using the alignment marks, install the rear window glass.

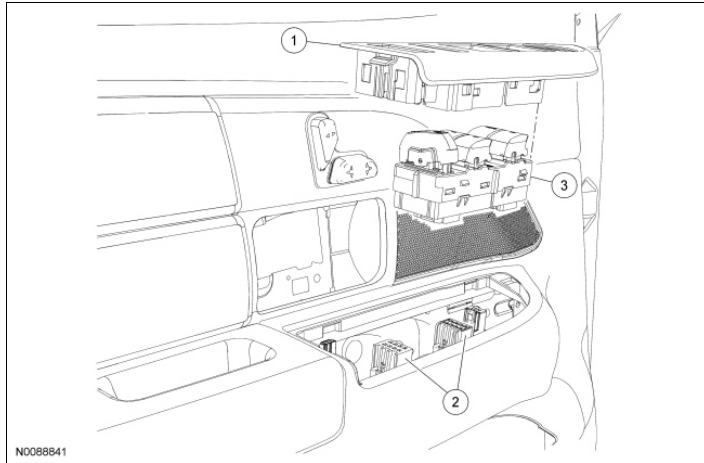
9. **⚠ WARNING:** Do not drive vehicle until the urethane adhesive seal has cured. Follow urethane adhesive manufacturer's curing directions. Inadequate or incorrect curing of the urethane adhesive seal will adversely affect glass retention. Failure to follow these instructions may result in serious injury to vehicle occupant(s).

**NOTE:** The urethane adhesive must cure for a minimum of one hour before testing for air or water leaks.

After the urethane adhesive has cured, check the rear window glass seal for air or water leaks through the urethane adhesive bead and add urethane adhesive as necessary.

10. Connect the rear window glass electrical connectors.
11. Install the package tray trim panel. For additional information, refer to [Section 501-05](#).



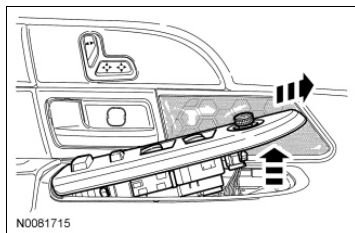
**Window Control Switch**

Item	Part Number	Description
1	14527	Window regulator switch housing
2	-	Window regulator switch housing electrical connectors (part of 14A005)
3	14529	Window regulator switch

**Removal and Installation**

1. **NOTE:** Left front door shown, all others similar.

Lift the front of the switch plate from the front door trim panel and position it aside.



2. Disconnect the electrical connectors.
3. Release the 4 locking tabs and remove the window control switch.
4. To install, reverse the removal procedure.





**Torque Specifications**

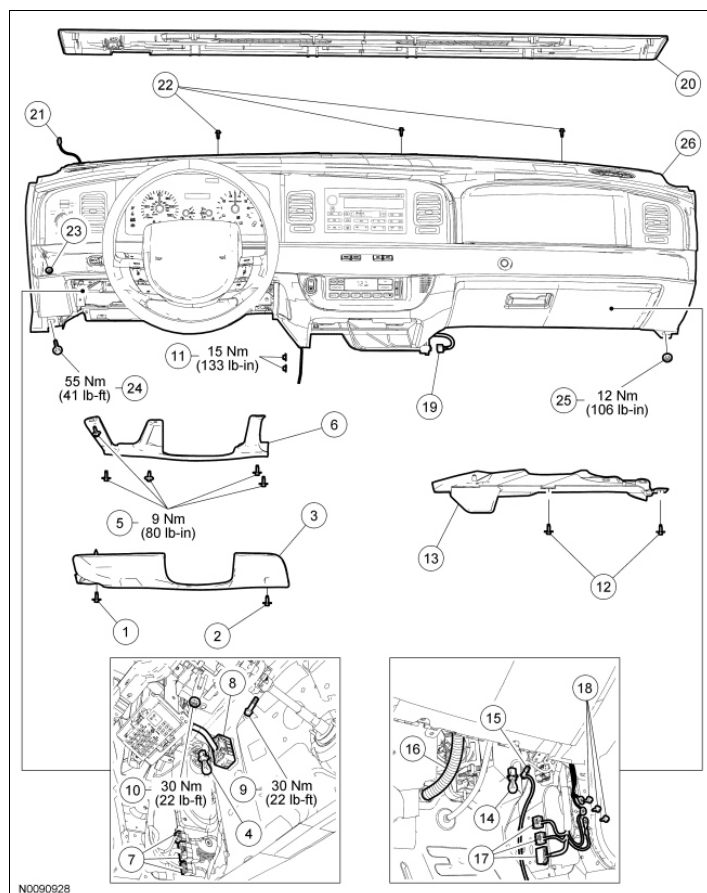
<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Bulkhead electrical connector bolt	5	-	44
Glove compartment hinge bolts	3	-	27
Instrument cluster finish panel screws	3	-	27
Instrument panel cowl side lower bolt (LH)	55	41	-
Instrument panel cowl side lower nut (RH)	12	-	106
Instrument panel cowl side upper nut (LH)	55	41	-
Instrument panel cowl top screws	3	-	27
Instrument panel tunnel brace nuts	15	-	133
Instrument panel wiring harness ground bolts	3	-	27
Intermediate shaft pinch bolt	30	22	-
Selector lever assembly bolts	12	-	106
Steering column brace nut	30	22	-
Steering column reinforcement screws	9	-	80

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SECTION 501-12: Instrument Panel and  
Console  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

### Instrument Panel - Exploded View



Item	Part Number	Description
1	390018	Parking brake release handle pushpin retainer
2	W707627	Pin-type retainer
3	04459	Steering column opening trim panel
4	-	Courtesy lamp socket (part of 14401)
5	N811610	Instrument panel steering column reinforcement screws (5 required)
6	04502	Instrument panel steering column reinforcement
7	-	Electrical connectors (part of 14401) (3 required)
8	-	Bulkhead electrical connector (part of 14401)
9	N806423	Intermediate shaft pinch bolt
10	045E24	Steering column brace nut
11	N621481	Instrument panel tunnel brace nuts (2 required)
12	388930	Instrument panel lower insulator pin-type retainers (2 required)
13	043A88	Instrument panel lower insulator
14	-	Courtesy lamp socket (part of 14401)

15	18812	Antenna cable
16	19D888	Electronic automatic temperature control hose (if equipped)
17	-	Electrical connectors (part of 14401) (3 required)
18	W705661	Instrument panel wiring harness ground bolts (3 required)
19	19C827	Climate control head vacuum harness connector
20	044E82	Instrument panel defroster opening grille
21	-	Sun load/auto lamp sensor electrical connector (if equipped) (part of 14401)
22	W707627	Instrument panel cowl top screws (3 required)
23	N620482	LH instrument panel cowl side nut
24	N804385	LH instrument panel cowl side lower bolt
25	N620480	RH instrument panel cowl side lower nut
26	04320	Instrument panel

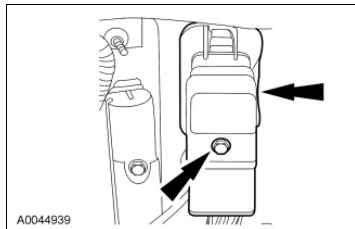
1. For additional information, refer to the procedures in this section.
-

## Instrument Panel

### Removal and Installation

#### All vehicles

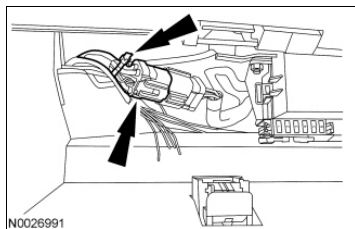
1. Place the selector lever in the No. 1 position.
2. Remove the steering wheel. For additional information, refer to [Section 211-04](#).
3. From under the hood, loosen the bolt and disconnect the LH bulkhead electrical connector.
  - To install, tighten to 5 Nm (44 lb-in).



4. Release the retainers and position the bulkhead electrical connector through the dash panel.

#### Vehicles with Police option

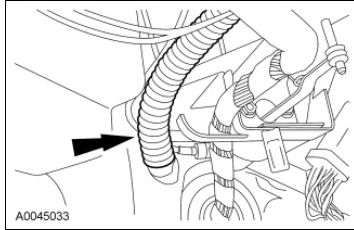
5. Remove the Battery Junction Box (BJB) wiring harness ties, disconnect the electrical connector and position the harness aside.



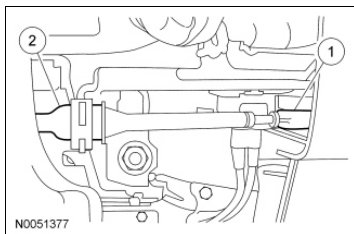
#### All vehicles

6. Remove the 2 pin-type retainers, disconnect the power point electrical connector and remove the RH instrument panel lower insulator.
7. Disconnect the RH lower instrument panel courtesy lamp.
8. Position the LH and RH front door weatherstrip seals aside.
9. Remove the LH and RH scuff plates.
10. Remove the LH and RH A-pillar lower trim panels.
11. Disconnect the antenna cable in-line connector.

12. Remove the 3 RH instrument panel wiring harness ground bolts.
13. Disconnect the 3 RH instrument panel wiring harness electrical connectors.
14. If equipped, disconnect the Electronic Automatic Temperature Control (EATC) hose from the evaporator housing.



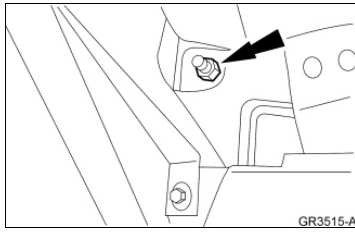
15. Disconnect the climate control head vacuum harness connector.
16. Remove the pin-type retainer and the steering column opening trim panel.
17. Remove the 5 screws and the instrument panel steering column reinforcement.
  - To install, tighten to 9 Nm (80 lb-in).
18. Remove the nut and position the steering column brace aside.
  - To install, tighten to 30 Nm (22 lb-ft).
19. Remove and discard the intermediate shaft pinch bolt.
  - Separate the intermediate shaft from the steering column shaft.
  - Install a new intermediate shaft pinch bolt and tighten to 30 Nm (22 lb-ft).
20. Disconnect the selector lever cable from the steering column.
  1. Disconnect the cable from the steering column shift tube lever.
  2. Disconnect the cable from the steering column bracket.



21. Disconnect the 3 LH instrument panel wiring harness electrical connectors.
22. Remove the pin-type retainer and the instrument panel tunnel brace cover.
23. Remove the 2 nuts and the instrument panel tunnel brace.
  - To install, tighten to 15 Nm (133 lb-in).
24. Remove the defroster opening grille.
  - If equipped, disconnect the electrical connectors.
25. Remove the 3 instrument panel cowl top screws.
26. Remove the RH instrument panel cowl side lower nut.
  - To install, tighten to 12 Nm (106 lb-in).

27. Remove the LH instrument panel cowl side upper nut.

- To install, tighten to 55 Nm (41 lb-ft).



28. Remove the LH instrument panel cowl side lower bolt.

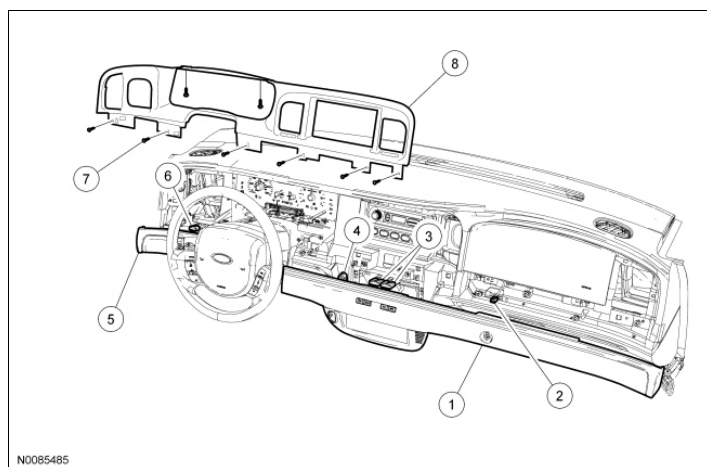
- To install, tighten to 55 Nm (41 lb-ft).

29. **NOTE:** An assistant is needed to carry out this step.

Remove the instrument panel from the vehicle.

30. To install, reverse the removal procedure.

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**Instrument Cluster Finish Panel**

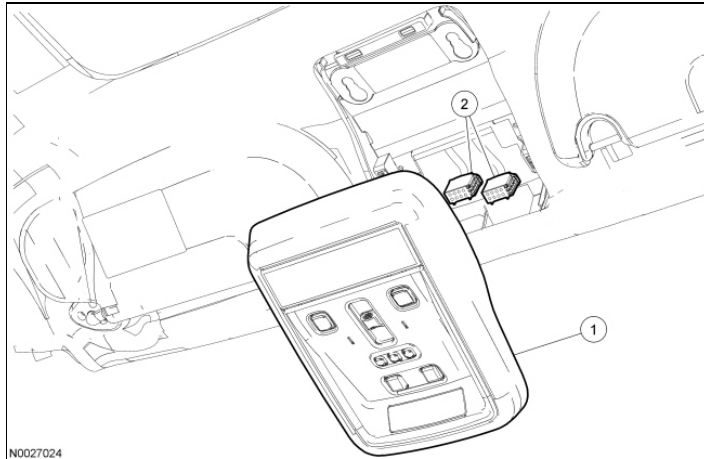
Item	Part Number	Description
1	046A62	RH instrument panel finish panel
2	-	Passenger airbag module electrical connector (part of 14401)
3	-	Function set-up switch electrical connectors (part of 14401) (2 required)
4	-	Rear window defrost switch electrical connector (part of 14401)
5	046A63	LH instrument panel finish panel
6	2A713	Traction control switch electrical connector (part of 14401)
7	N807122	Instrument cluster finish panel screw (8 required)
8	044D70	Instrument cluster finish panel

**Removal and Installation**

1. Place the selector lever in the No. 1 position.
2. **NOTE:** The ignition switch must be in the OFF position if disconnecting the Passenger Air Bag Deactivation (PAD) indicator electrical connector. Otherwise, a DTC will be set in the Restraints Control Module (RCM) memory and must be cleared before releasing the vehicle.  
  
Position the ignition switch in the OFF position and wait at least one minute.
3. Remove the audio unit. For additional information, refer to [Section 415-00](#) .
4. Remove the RH instrument panel finish panel and disconnect the 3 electrical connectors.
5. Remove the LH instrument panel finish panel and disconnect the electrical connector.
6. Tilt the steering column in the full down position.

7. Remove the 8 screws and the instrument cluster finish panel.
    - Disconnect the electrical connectors.
  8. To install, reverse the removal procedure.
-



**Console - Overhead**

Item	Part Number	Description
1	13562	Overhead console
2	W701679	Overhead console electrical connectors (part of 14334) (2 required)

**Removal and Installation**

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

1. **NOTICE:** The overhead console bracket is supported by the headliner. Failure to follow the removal procedure will damage the headliner.

Support the headliner at the rear corner of the overhead console and pull down on that corner to remove the overhead console.

- Disconnect the 2 electrical connectors.

2. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure.

- To install, make sure to align the overhead console retaining clips to the retaining clip holes in the headliner bracket.



SECTION 501-14: Handles, Locks, Latches and Entry  
Systems  
SPECIFICATIONS

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

Material

Item	Specification	Fill Capacity
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B	-
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-	-

**Torque Specifications**

Description	Nm	lb-in
Door latch screws	6	53
Hood latch bolts	12	106
Hood latch release cable handle bolt	5	44
Hood latch release cable handle nut	5	44
Hood latch striker bolts	12	106
Luggage compartment lid latch bolts	12	106

## **Handles, Locks, Latches and Entry Systems**

### **Hood Latch**

The hood latch consists of the following components:

- Hood latch
- Hood latch striker
- Hood latch release handle and cable

### **Front Door**

The front door consists of the following components:

- Actuating rods
- Door ajar switches
- Door latch remote control and links
- Door lock actuators
- Door lock cylinder
- Exterior door handles
- Front door latches
- Front door lock push button rods
- Interior door handles

### **Rear Door**

The rear door consists of the following components:

- Door ajar switches
- Door latch remote control and links
- Door lock actuators
- Exterior door handles
- Interior door handles (part of the door trim panel)
- Rear door latches
- Rear lock rod and bell crank

### **Luggage Compartment**

The luggage compartment system consists of the following components:

- Luggage compartment lid latch
- Luggage compartment lid lock cylinder
- Luggage compartment lid release switch (located on the driver door panel)

The luggage compartment lid latch is equipped with a mechanical interior release handle (located on the latch).

The luggage compartment lid can be released with the Remote Keyless Entry (RKE) transmitter (if equipped), the keyless entry keypad (if equipped), the luggage compartment lid release switch, or the luggage compartment lid lock cylinder.

## **Lock Cylinders**

Individual lock cylinders are repaired by discarding the inoperative lock cylinder and building a new lock cylinder using the appropriate lock repair package. The lock repair package includes a detailed instruction sheet to build the new lock cylinder to the current key code of the vehicle.

## **Autolock**

The autolocking function automatically locks all doors when all of the following conditions are concurrently met during the current key cycle:

- All the doors are closed
- The autolocking function is active
- The ignition switch is in the RUN position
- The transmission is in any forward gear
- The vehicle speed exceeds 5 km/h (3 mph)

After the initial activation of autolocking and at least one door has been opened, autolocking is activated again if the following conditions are concurrently met:

- All the doors are closed
- The autolocking function is active
- The ignition switch is in the RUN position
- The transmission is in any forward gear
- The vehicle speed exceeds 5 km/h (3 mph)

## **Auto-Unlock**

The auto-unlocking function automatically unlocks all the doors when the following conditions are met:

- The vehicle speed has exceeded 5 km/h (3 mph) then dropped to 0 km/h (0 mph)
- The key is turned to the OFF or ACC position
- The driver door is opened within 10 minutes of the key being turned to the OFF or ACC position

The auto-unlock feature is cancelled if the doors are locked with the door lock control switch or the RKE transmitter within the 10-minute active window. After the 10-minute active window expires, the auto-unlock feature does not unlock the doors if the driver door is opened.

## **Smart Unlock**

The smart unlock feature prevents the driver door from locking with the key in the ignition lock cylinder. When the Driver Door Module (DDM) receives a LOCK command from a door lock control switch, and the key is in the ignition lock cylinder with the driver door open, the DDM commands all the doors to lock, then unlock.

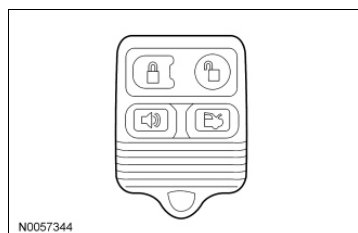
## **Unlock Inhibit Feature**

The unlock inhibit feature disables the interior door lock control switches and the interior luggage compartment lid release button when the perimeter alarm becomes armed. Once the interior switches are disabled, they can only become active once the perimeter alarm is disarmed.

## **Remote Keyless Entry (RKE)**

The RKE system consists of the following components:

- DDM
- Tire Pressure Monitoring System (TPMS)/ RKE antenna (located on the RH C-pillar)
- RKE transmitter



The RKE transmitter initiates the following electronic system functions:

- Releases the luggage compartment lid
- Unlocks the driver door
- Unlocks all doors
- Locks all doors.
- Arms/disarms the perimeter alarm or inhibits the alarm for the luggage compartment
- Activates/deactivates the panic alarm
- Commands the interior lamps on (when unlocking) and off (when locking)
- Sounds the horn once when LOCK is pressed twice within 3 seconds, and the hood, luggage compartment lid and doors are closed
- Sounds the horn twice when LOCK is pressed twice within 3 seconds if any door, hood or luggage compartment lid is not closed

The RKE transmitter has a normal operating range of 10 m (33 ft).

The RKE transmitters can be programmed using a scan tool or by using the ignition lock cylinder method. Refer to Remote Keyless Entry (RKE) Transmitter Programming in this section for programming information.

### **Remote Keyless Entry (RKE) Lock/Unlock Control - Unlock**

The RKE transmitter feature provides lock/unlock functions independently of the key position and the vehicle speed. The RKE transmitter feature provides a 2-step process for unlocking the doors. Upon receipt of the first request for unlocking the doors, the remote control feature requests the DDM to unlock the driver door only. If another unlock request is received within 3 seconds of the first, the RKE transmitter feature requests that all doors be unlocked.

### **Remote Keyless Entry (RKE) Lock/Unlock Control - Lock**

The RKE transmitter feature requests that all the doors be locked when the LOCK button on the RKE transmitter is pressed. On any press of the LOCK button with all doors closed, the RKE feature requests one flash of the parking lamps. If any door is ajar, no flash occurs, indicating the DDM locked all the doors but one or more doors are ajar. When the last door is closed, the vehicle provides one flash of the parking lamps. If 2 presses of the LOCK button are received within 3 seconds, the horn chirps once, and the parking lamps flash to indicate that all the doors are closed and locked. If any door is ajar when the second lock request is received within 3 seconds of the first, the RKE transmitter feature requests the horn chirp twice without flashing the parking lamps to indicate it locked all the doors but one or more doors are ajar. When the key is in the RUN or START position, no parking lamp flashes or horn chirp confirmations occur.

### **Remote Keyless Entry (RKE) Luggage Compartment Lid Release**

The RKE feature provides a luggage compartment lid release. The feature operates regardless of key position. The feature is inhibited when the vehicle speed is 5 km/h (3 mph) or greater.

## **Panic Alarm**

The panic alarm feature provides audible and visual alarms which are evident from the exterior of the vehicle. The panic alarm feature requests that the parking lamps flash and the horn sounds until deactivation. The flashing of the outputs occurs simultaneously. The panic alarm is activated by pressing the PANIC button on an RKE transmitter when the key is in the OFF position, or the key is out of the ignition lock cylinder. At all other times this feature is disabled. The panic alarm is deactivated by: a second press of the RKE transmitter PANIC button, the key is switched out of the OFF position, or a period of 2 minutes and 45 seconds has elapsed since the initial activation.

## **Keyless Entry Keypad**

The keypad does not operate if the driver door is ajar.

The keypad provides a method for the customer to access the vehicle without a key or RKE transmitter. The keyless entry keypad feature:

- locks all doors.
- unlocks only the driver door.
- unlocks all doors.
- programs/erases the customer key code.
- enables/disables autolocking and auto-unlocking.
- arms/disarms the perimeter alarm.
- releases the luggage compartment lid latch.

The keypad feature operates independently of the key position status. When a keypad button is pressed, the keypad buttons illuminate to provide better visibility. If the 7/8 and 9/0 buttons are pressed simultaneously to lock all doors or 5 seconds have elapsed since the last button press, the illumination is turned off.

Each vehicle equipped with a keypad is programmed with a 5-digit factory set entry code. This code is provided to the customer on a wallet card. In addition, this code is available through a scan tool. When entering codes, each digit must be entered within 5 seconds of the previous button press. In addition to the factory set code, 3 personal keyless entry keypad codes can be set. For information on programming the personal keyless entry codes, refer to Keyless Entry Keypad Code Programming in this section.

## **Unlocking the Doors with the Keyless Entry Keypad System**

To unlock the driver door, enter either the factory set code or the personal code (each digit must be pressed within 5 seconds of the prior digit). The interior lamps will illuminate.

To unlock all doors, enter either the factory set code or the personal code (driver door unlocks) and press the 3/4 button within 5 seconds.

## **Locking the Doors with the Keyless Entry Keypad System**

It is not necessary to enter the factory set or personal code prior to locking all doors. To lock all doors, press the 7/8 and 9/0 buttons at the same time.

## **Releasing the Luggage Compartment Lid with the Keyless Entry Keypad System**

To release the luggage compartment, enter the factory set or the personal code and the driver door will unlock. Press the 5/6 button within 5 seconds.

## **Anti-Scan Feature**

To provide added security, the keyless entry keypad is disabled for 1 minute after 35 button presses without a valid entry code being entered. The keypad flashes during this 1-minute mode with all functionality disabled except for the 7/8 and 9/0 buttons still being allowed to lock the vehicle.




Anti-scan is turned off after 1 minute of keypad inactivity or if the doors are electronically unlocked using an RKE transmitter or a door lock control switch.

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**Handles, Locks, Latches and Entry Systems**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 105-R025D or equivalent

## Material

Item	Specification
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-

**Principles Of Operation****Power Locks**

The power lock/unlock feature requests all of the vehicle doors to lock or unlock upon a request from the door lock control switch, the keyless entry keypad, or the Remote Keyless Entry (RKE) transmitter. Power locking and unlocking functions independently of the key position, the vehicle speed or the transmission position. The Driver Door Module (DDM) activates internal relays to supply the correct power and grounds for the door lock actuators.

**Opening the Luggage Compartment Lid with the Luggage Compartment Lid Release Switch****Without Police Package**

The luggage compartment lid can be released with the RKE transmitter, the keyless entry keypad, the luggage compartment lid release switch (with the key in the ON position) or the luggage compartment lid lock cylinder.

**With Police Package**

The luggage compartment lid can only be released with the luggage compartment lid release switches or the luggage compartment lid lock cylinder. The RKE luggage compartment lid release function is disabled on Police package vehicles.

**Remote Keyless Entry (RKE)**

The DDM interprets radio frequency signals from the RKE transmitters. The DDM requests the illuminated entry feature to turn the interior lamps on when an unlock command is received.

The RKE transmitter supplies a signal to the Tire Pressure Monitoring System (TPMS) / RKE antenna when any button is pressed. The TPMS / RKE antenna is hardwired to the DDM and sends the RKE signal to the DDM. The DDM interprets the RKE signal then supplies voltage to the appropriate door lock actuator(s) to lock or unlock the doors or release the luggage compartment lid. The RKE transmitter can also be used to activate the panic alarm.

**Keyless Entry Keypad**

The keyless entry keypad is hardwired to the DDM. The DDM interprets the inputs from the keyless entry keypad and then controls the associated operation. The keyless entry keypad is illuminated for 5 seconds when any button is pressed. The DDM requests the illuminated entry feature to turn the interior lamps on when a valid entry code is received. If a lock all doors code is entered, the illuminated entry feature turns off.

**NOTE:** The keyless entry keypad does not lock the doors if the driver door is ajar.

The keyless entry keypad supplies a signal to the DDM when the buttons are pressed. The DDM then supplies voltage to the appropriate door lock actuator(s) to lock or unlock the doors or release the luggage compartment lid.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 419-03** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect the following for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Binding latches</li> <li>• Door handles</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 8 (20A)</li> <li>◆ 601 (20A) (circuit breaker)</li> <li>◆ 602 (20A) (circuit breaker)</li> </ul> </li> <li>• Central Junction Box (CJB) fuse 2 (7.5A)</li> <li>• Wiring, terminals or connectors</li> <li>• Door lock control switches</li> <li>• Keyless entry keypad</li> </ul>

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Luggage compartment lid release switch</li> </ul> |
|--|

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the Driver Door Module (DDM) and Lighting Control Module (LCM).

9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### Driver Door Module (DDM) DTC Chart

DTC	Description	Action
B1148	Radio Frequency Power Output Circuit Short to Ground	<u>GO to Pinpoint Test I</u> .
B1149	Radio Frequency Enable Output Circuit Short to Battery	<u>GO to Pinpoint Test I</u> .
B1150	Radio Frequency Enable Output Circuit Short to Ground	<u>GO to Pinpoint Test I</u> .
B1151	Radio Frequency AM/FM Signal Key Select Output	<u>GO to Pinpoint Test I</u> .

	Circuit Short to Ground	
B1152	Radio Frequency AM/FM Signal Key Select Output Circuit Short to Battery	<u>GO to Pinpoint Test I .</u>
B1309	Power Door Lock Circuit Short To Ground	<u>GO to Pinpoint Test C .</u>
B1341	Power Door Unlock Circuit Short To Ground	<u>GO to Pinpoint Test C .</u>
B1553	Decklid Release Circuit Short To Battery	<u>GO to Pinpoint Test E .</u>
B2276	Less Than 2 Transmitters Programmed	PROGRAM all of the customers Remote Keyless Entry (RKE) transmitters (minimum of 2). REFER to <u>Remote Keyless Entry (RKE) Transmitter Programming</u> in this section. TEST the system for normal operation.
B2425	Remote Keyless Entry Out Of Synchronization	<u>GO to Pinpoint Test I .</u>
B2695	Keypad_A Switch Circuit Failure	<u>GO to Pinpoint Test G .</u>
B2696	Keypad_B Switch Circuit Failure	<u>GO to Pinpoint Test G .</u>
B2697	Keypad_C Switch Circuit Failure	<u>GO to Pinpoint Test G .</u>
B2718	Liftgate/Decklid Ajar Output Short to Battery	<u>GO to Pinpoint Test E .</u>
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10 .</u>

### Lighting Control Module (LCM) DTC Chart

DTC	Description	Action
U1197	SCP (J1850) Invalid or Missing Data For Door Locks	This DTC is set when the Lighting Control Module (LCM) receives an invalid or missing door lock message from the Driver Door Module (DDM). REPAIR all non-network DTCs. REFER to <u>Section 419-10</u> for a list of all DTCs.
U1199	SCP (J1850) Invalid or Missing Data for External Access (Doors)	This DTC is set when the LCM receives invalid or missing door ajar status from the DDM . REPAIR all non-network DTCs. REFER to <u>Section 419-10</u> for a list of all DTCs.
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10 .</u>

### Symptom Chart

Symptom Chart - Electrical

## Symptom Chart - Mechanical

**Pinpoint Tests****Pinpoint Test A: All Door Locks Are Inoperative**

Refer to Wiring Diagrams Cell 110 , Power Door Locks for schematic and connector information.

**Normal Operation**

The Battery Junction Box (BJB) fuse 8 (20A) provides voltage for the power lock/unlock system and the luggage compartment lid latch (on vehicles without the police package). Based on inputs from the door lock control switches, Remote Keyless Entry (RKE) Transmitter, or keyless entry keypad (if equipped) the Driver Door Module (DDM) locks or unlocks the doors. Upon a lock request, the DDM supplies voltage on the all door lock circuit and ground on the driver and passenger door unlock circuits. Upon an unlock request, the voltage and ground are reversed on the previously listed circuits. When the door lock and unlock relays are not energized they are connected to ground. A dedicated DDM ground circuit is provided only for the lock and unlock relays.

**This pinpoint test is intended to diagnose the following:**

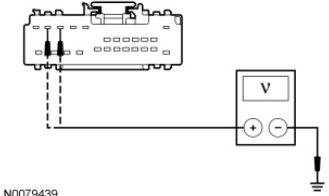
- Fuse
- Wiring, terminals or connectors
- Luggage compartment lid latch
- DDM

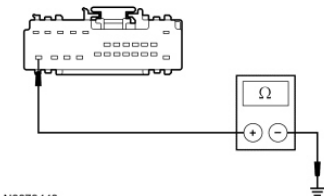
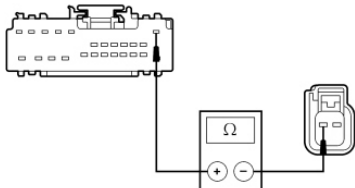
**PINPOINT TEST A: ALL DOOR LOCKS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>A1 VERIFY THE OPERATION OF BOTH DOOR LOCK CONTROL SWITCHES</b>	
<ul style="list-style-type: none"> <li>• Press the lock and unlock button of both door lock control switches while observing the door lock operation.</li> <li>• <b>Are the door locks inoperative from both switches?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> GO to <u>Pinpoint Test D</u> .</p>
<b>A2 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded DDM DTCs from the self-test.</li> <li>• <b>Are any DTCs retrieved?</b></li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <u>A3</u> .</p>

<b>A3 CHECK FOR VOLTAGE TO THE DDM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501b.</li> <li>• Measure the voltage between the DDM C501b-10, circuit 1213 (WH/LB), harness side and ground; and between the DDM C501b-11, circuit 1213 (WH/LB), harness side and ground.</li> </ul>  <p>N0079439</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">A7</a> .</p> <p><b>No</b> VERIFY the BJB fuse 8 (20A) is OK.</p> <p>If OK, REPAIR circuit 1213 (WH/LB) for an open. TEST the system for normal operation.</p> <p>If not OK (vehicles without the police package), GO to <a href="#">A4</a> .</p> <p>If not OK (vehicles with the police package), GO to <a href="#">A6</a> .</p>
<b>A4 CHECK THE LUGGAGE COMPARTMENT LID RELEASE OUTPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Connect: DDM C501b.</li> <li>• <b>NOTE:</b> If the BJB fuse 8 (20A) fails immediately, repair circuit 1213 (WH/LB) for a short to ground.</li> <li>• Install a new BJB fuse 8 (20A).</li> <li>• Operate the luggage compartment lid release by pressing the luggage compartment lid release switch.</li> <li>• <b>Is the BJB fuse 8 (20A) OK?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">A6</a> .</p> <p><b>No</b> GO to <a href="#">A5</a> .</p>
<b>A5 CHECK THE LUGGAGE COMPARTMENT LID RELEASE SOLENOID</b>	
<ul style="list-style-type: none"> <li>• Connect: Luggage Compartment Lid Latch C430.</li> <li>• Install a new BJB fuse 8 (20A).</li> <li>• Operate the luggage compartment lid release by pressing the luggage compartment lid release switch.</li> <li>• <b>Is the BJB fuse 8 (20A) OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new luggage compartment lid latch. REFER to <a href="#">Luggage Compartment Lid Latch</a> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 84 (VT/YE) for a short to ground. TEST the system for normal operation.</p>
<b>A6 CHECK THE ALL LOCK CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Connect: DDM C501b.</li> <li>• <b>NOTE:</b> If the BJB fuse 8 (20A) fails immediately, repair circuit 1213 (WH/LB) for a short to ground.</li> <li>• Install a new BJB fuse 8 (20A).</li> <li>• Operate the door lock actuators by pressing LOCK on the door lock control switch.</li> <li>• <b>Is the BJB fuse 8 (20A) OK?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 118 (PK/OG) or circuit 163 (RD/OG) for a short to ground. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 117 (PK/BK) for a short to ground. TEST the system</p>

	for normal operation.
<b>A7 CHECK THE DDM GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the DDM C501b-24, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0079440</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A8</a> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<b>A8 CHECK THE ALL LOCK CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LH Front Door Lock Actuator C525.</li> <li>• Measure the resistance between the DDM C501b-1, circuit 117 (PK/BK), harness side and the LH front door lock actuator C525-2, circuit 117 (PK/BK), harness side.</li> </ul>  <p>N0027101</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A9</a> .</p> <p><b>No</b> REPAIR circuit 117 (PK/BK) for an open. TEST the system for normal operation.</p>
<b>A9 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test B: A Single/More Than One Door Lock Is Inoperative**

Refer to Wiring Diagrams Cell [110](#) , Power Door Locks for schematic and connector information.

**Normal Operation**

The Battery Junction Box (BJB) fuse 8 (20A) provides voltage for the power lock/unlock system and the luggage compartment lid latch (on vehicles without the police package). Based on inputs from the door lock control switches, Remote Keyless Entry (RKE) transmitter or keyless entry keypad (if equipped) the Driver Door Module (DDM) locks or unlocks the doors. Upon a lock request, the DDM supplies voltage on the all door lock circuit and ground on the driver and passenger door unlock circuits. Upon an unlock request, the voltage and ground are reversed on the previously listed circuits. When the door lock and unlock relays are not energized they are connected to ground. A dedicated DDM ground circuit is provided only for the lock and unlock relays.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Door lock actuator
- DDM

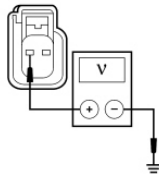
**PINPOINT TEST B: A SINGLE/MORE THAN ONE DOOR LOCK IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>B1 CHECK THE DOOR LATCH FOR BINDING</b>	
<ul style="list-style-type: none"> <li>• Lock and unlock the inoperative door lock using the door lock rod.</li> <li>• <b>Does the door lock and unlock?</b></li> </ul>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> GO to <u>B2</u> .</p>
<b>B2 CHECK THE LOCK ROD FOR BINDING</b>	
<ul style="list-style-type: none"> <li>• Operate the door lock rod manually while observing the door lock rod for any binding or if the rod is bent.</li> <li>• <b>Is the door lock rod bent or binding?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> or <u>Rear Door Latch</u> in this section. TEST the system for normal operation.</p>
<b>B3 CHECK THE ALL LOCK CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Door Lock Actuator.</li> <li>• <b>NOTE:</b> The DDM only supplies voltage to the actuator momentarily. It is important to monitor the meter while pressing the door lock control switch.</li> <li>• While pressing the door lock control switch in the LOCK position, measure the voltage between the inoperative door lock actuator, harness side and ground as follows:</li> </ul>	<p><b>Yes</b> GO to <u>B4</u> .</p> <p><b>No</b> REPAIR circuit 117 (PK/BK) for an open. TEST the system for normal operation.</p>



Inoperative Door Lock Actuator	Connector-Pin	Circuit
LH front	C525-2	117 (PK/BK)
RH front	C603-2	117 (PK/BK)
LH rear	C704-2	117 (PK/BK)
RH rear	C804-2	117 (PK/BK)



N0075565

- Is the voltage momentarily greater than 10 volts?

**B4 CHECK THE UNLOCK CIRCUITS FOR VOLTAGE**

- **NOTE:** The DDM only supplies voltage to the actuator momentarily. It is important to monitor the meter while pressing the door lock control switch.
- While pressing the door lock control switch in the UNLOCK position, measure the voltage between the inoperative door lock actuator, harness side and ground as follows:

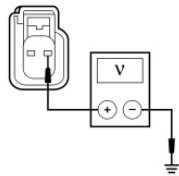
Inoperative Door Lock Actuator	Connector-Pin	Circuit
LH front	C525-1	163 (RD/OG)
RH front	C603-1	118 (PK/OG)
LH rear	C704-1	118 (PK/OG)
RH rear	C804-1	118 (PK/OG)

**Yes**

INSTALL a new door lock actuator. REFER to Front Door Lock Actuator or Rear Door Lock Actuator in this section. TEST the system for normal operation.

**No**

GO to B5 .



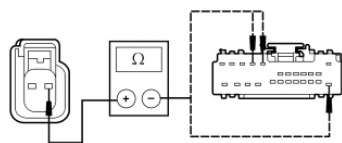
N0075564

- Is the voltage momentarily greater than 10 volts?

**B5 CHECK THE UNLOCK CIRCUITS FOR AN OPEN**

- Disconnect: DDM C501b.
- Measure the resistance between the inoperative door lock actuator, harness side and the DDM , harness side as follows:

Inoperative Door Lock Actuator Connector-Pin	DDM Connector-Pin	Circuit
LH front C525-1	C501b-8 C501b-9	163 (RD/OG)
RH front C603-1	C501b-13	118 (PK/OG)
LH rear C704-1	C501b-13	118 (PK/OG)
RH rear C804-1	C501b-13	118 (PK/OG)



N0107386

- Is the resistance less than 5 ohms?

**B6 CHECK FOR CORRECT DDM OPERATION**

- Disconnect all the DDM connectors.
- Check for:
  - ♦ corrosion
  - ♦ damaged pins
  - ♦ pushed-out pins
- Connect all the DDM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- Is the concern still present?

**Yes**GO to **B6** .**No**

REPAIR the circuit in question for an open. TEST the system for normal operation.

**Yes**

INSTALL a new DDM . REFER to **Section 419-10** . TEST the system for normal operation.

**No**

The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

**Pinpoint Test C: The Door Locks Operate Only One Way**

Refer to Wiring Diagrams Cell 110 , Power Door Locks for schematic and connector information.

**Normal Operation**

The Driver Door Module (DDM) sends voltage signals to the door lock control switches through the lock and unlock input circuits. When the lock or unlock switch is pressed, the corresponding voltage signal is routed to ground, signaling the DDM to lock or unlock the doors. The door lock control switches have a dedicated ground circuit.

- DTC B1309 (Power Door Lock Circuit Short To Ground) - a continuous and on-demand DTC that sets when the DDM detects a short to ground on the lock input circuit. This DTC may also set if the lock switch is pressed for longer than 2 minutes.
- DTC B1341 (Power Door Unlock Circuit Short To Ground) - a continuous and on-demand DTC that sets when the DDM detects a short to ground on the unlock input circuit. This DTC may also set if the unlock switch is pressed for longer than 2 minutes.

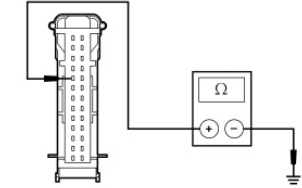
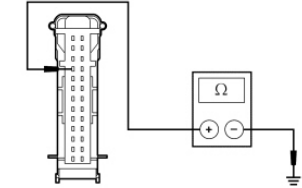
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Door lock control switch
- DDM

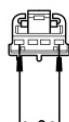
**PINPOINT TEST C: THE DOOR LOCKS OPERATE ONLY ONE WAY**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>C1 CHECK THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check the recorded results from the DDM self-test.</li> <li>• Is DTC B1309 or DTC B1341 present?</li> </ul>	<b>Yes</b> GO to <u>C2</u> .  <b>No</b> GO to <u>C5</u> .
<b>C2 CHECK THE LH DOOR LOCK CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LH Door Lock Control Switch C505.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM Self-Test.</li> <li>• Is DTC B1309 or DTC B1341 present?</li> </ul>	<b>Yes</b> LEAVE the switch disconnected. GO to <u>C3</u> .  <b>No</b> INSTALL a new LH door lock control switch. REFER to <u>Door Lock Control Switch</u> in this section. TEST the system for normal operation.
<b>C3 CHECK THE RH DOOR LOCK CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RH Door Lock Control Switch C605.</li> </ul>	<b>Yes</b> LEAVE the switch disconnected.

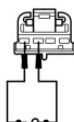
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DDM Self-Test.</li> <li>• <b>Is DTC B1309 or DTC B1341 present?</b></li> </ul>	<p>GO to <u>C4</u> .</p> <p><b>No</b> INSTALL a new RH door lock control switch. REFER to <u>Door Lock Control Switch</u> in this section. TEST the system for normal operation.</p>
<b>C4 CHECK THE LOCK INPUT CIRCUIT OR UNLOCK INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Ignition ON.</li> <li>• For DTC B1309, measure the resistance between the DDM C501a-9, circuit 119 (PK/YE), harness side and ground.</li> </ul>  <p>N0085746</p> <ul style="list-style-type: none"> <li>• For DTC B1341, measure the resistance between the DDM C501a-10, circuit 120 (PK/LG), harness side and ground.</li> </ul>  <p>N0085747</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b> REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p>
<b>C5 VERIFY THE OPERATION OF BOTH DOOR LOCK CONTROL SWITCHES</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Press the lock and unlock button of both door lock control switches while observing the door lock operation.</li> <li>• <b>Do the door locks operate only one way from both switches?</b></li> </ul>	<p><b>Yes</b> GO to <u>C7</u> .</p> <p><b>No</b> GO to <u>C6</u> .</p>
<b>C6 CHECK THE LOCK INPUT OR UNLOCK INPUT CIRCUIT FOR AN OPEN (SINGLE SWITCH INOPERATIVE)</b>	

- Disconnect: Suspect Door Lock Control Switch.
- Unlock the doors from the working door lock control switch.
- Connect a fused jumper wire between the LH door lock control switch C505-1, circuit 119 (PK/YE), harness side and the LH door lock control switch C505-4, circuit 57 (BK), harness side; or between the RH door lock control switch C605-1, circuit 119 (PK/YE), harness side and the RH door lock control switch C605-4, circuit 57 (BK), harness side.



N0058784

- Remove the jumper wire.
- Connect a fused jumper wire between the LH door lock control switch C505-3, circuit 120 (PK/LG), harness side and the LH door lock control switch C505-4, circuit 57 (BK), harness side; or between the RH door lock control switch C605-3, circuit 120 (PK/LG), harness side and the RH door lock control switch C605-4, circuit 57 (BK), harness side.

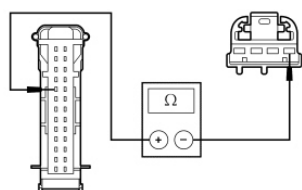


N0058803

- **Do the doors lock and unlock with the jumper wire?**

#### **C7 CHECK THE LOCK INPUT OR UNLOCK INPUT CIRCUIT FOR AN OPEN (BOTH SWITCHES INOPERATIVE)**

- Disconnect: LH Door Lock Control Switch C505.
- Disconnect: DDM C501a.
- If the doors do not lock, measure the resistance between the DDM C501a-9, circuit 119 (PK/YE), harness side and the LH door lock control switch C505-1, circuit 119 (PK/YE), harness side.



N0085748

#### **Yes**

REMOVE the jumper wire. INSTALL a new door lock control switch. REFER to Door Lock Control Switch in this section. TEST the system for normal operation.

#### **No**

REMOVE the jumper wire. REPAIR the input circuit in question. TEST the system for normal operation.

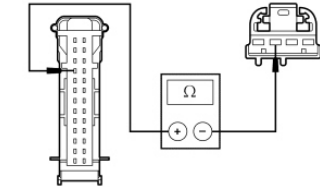
#### **Yes**

GO to C8.

#### **No**

REPAIR the circuit in question. TEST the system for normal operation.

- If the doors do not unlock, measure the resistance between the DDM C501a-10, circuit 120 (PK/LG), harness side and the LH door lock control switch C505-3, circuit 120 (PK/LG), harness side.



N0085749

- **Is the resistance less than 5 ohms?**

#### C8 CHECK FOR CORRECT DDM OPERATION

- Disconnect all the DDM connectors.
- Check for:
  - ♦ corrosion
  - ♦ damaged pins
  - ♦ pushed-out pins
- Connect all the DDM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

#### Yes

INSTALL a new DDM . REFER to Section 419-10 . TEST the system for normal operation.

#### No

The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

### Pinpoint Test D: All Door Locks Are Inoperative From One Switch

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

#### Normal Operation

The Driver Door Module (DDM) sends voltage signals to the door lock control switches through the lock and unlock input circuits. When the lock or unlock switch is pressed, the corresponding voltage signal is routed to ground, signaling the DDM to lock or unlock the doors. The door lock control switches have a dedicated ground circuit.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Door lock control switch

#### PINPOINT TEST D: ALL DOOR LOCKS ARE INOPERATIVE FROM ONE SWITCH

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take

<b>D1 CHECK THE SUSPECT DOOR LOCK CONTROL SWITCH FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Suspect Door Lock Control Switch.</li> <li>• Carry out the door lock control switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Is the door lock control switch OK?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new door lock control switch. REFER to <u>Door Lock Control Switch</u> in this section. TEST the system for normal operation.</p>

### **Pinpoint Test E: The Luggage Compartment Lid Release Is Inoperative/Does Not Operate Correctly - Without Police Package**

Refer to Wiring Diagrams Cell 113 , Luggage Compartment for schematic and connector information.

#### **Normal Operation**

When the Driver Door Module (DDM) receives an open request from the luggage compartment lid release switch, a Remote Keyless Entry (RKE) transmitter or the keyless entry keypad (if equipped), the DDM supplies voltage to the luggage compartment lid latch which releases the latch. The luggage compartment lid latch has a dedicated ground circuit.

The luggage compartment lid release switch is supplied voltage at all times through the Central Junction Box (CJB) fuse 2 (7.5A). When the switch is pressed, the voltage is supplied to the DDM , signaling it to release the luggage compartment lid.

- DTC B1553 (Decklid Release Circuit Short To Battery) - a continuous and on-demand DTC that sets when the DDM detects a short to voltage on the luggage compartment lid release switch input circuit. The DTC is also set if the luggage compartment lid release switch is pressed for longer than 2 minutes.
- DTC B2718 (Liftgate/Decklid Ajar Output Short to Battery) - a continuous and on-demand DTC that sets when the DDM detects a short to voltage on the luggage compartment lid release output circuit.

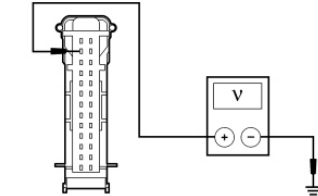
#### **This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Luggage compartment lid release solenoid (part of the luggage compartment lid latch)
- Luggage compartment lid release switch
- DDM

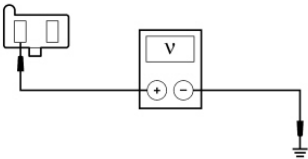
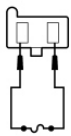
### **PINPOINT TEST E: THE LUGGAGE COMPARTMENT LID RELEASE IS INOPERATIVE/DOES NOT OPERATE CORRECTLY - WITHOUT POLICE PACKAGE**

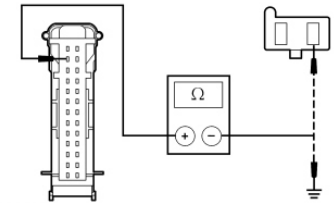
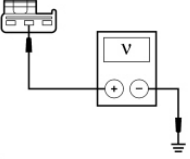
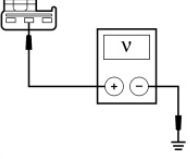
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

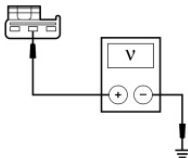
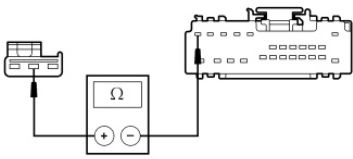
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

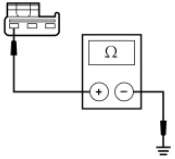
Test Step	Result / Action to Take
<b>E1 CHECK THE DOOR LOCK OPERATION</b>	
<ul style="list-style-type: none"> <li>Lock and unlock the doors using a door lock control switch.</li> <li><b>Do the door locks operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> GO to <u>Pinpoint Test A</u> .</p>
<b>E2 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>Check for recorded DDM DTCs from the self-test.</li> <li><b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> For DTC B1553, GO to <u>E3</u> .  For DTC B2718, GO to <u>E9</u> .  For all other DDM DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <u>E5</u> .</p>
<b>E3 RERUN THE DDM SELF-TEST</b>	
<ul style="list-style-type: none"> <li>Ignition ON.</li> <li>Disconnect: Luggage Compartment Lid Release Switch C534.</li> <li>Clear the DTCs, then rerun the DDM self-test.</li> <li><b>Is DTC B1553 present?</b></li> </ul>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> INSTALL a new luggage compartment lid release switch. TEST the system for normal operation.</p>
<b>E4 CHECK THE LUGGAGE COMPARTMENT LID RELEASE INPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: DDM C501a.</li> <li>Ignition ON.</li> <li>Measure the voltage between the DDM C501a-12, circuit 26 (WH/VT), harness side and ground.</li> </ul>  <p>N0027096</p> <ul style="list-style-type: none"> <li><b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 26 (WH/VT) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>E14</u> .</p>
<b>E5 CARRY OUT THE DDM LUGGAGE COMPARTMENT RELEASE ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>Ignition ON.</li> </ul>	<p><b>Yes</b> GO to <u>E6</u> .</p>



<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Active command the DDM PID (RELEASE).</li> <li>• <b>Does the luggage compartment lid release?</b></li> </ul>	<p><b>No</b> GO to <u>E9</u> .</p>
<b>E6 CHECK THE LUGGAGE COMPARTMENT LID RELEASE INPUT CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Luggage Compartment Lid Release Switch C534.</li> <li>• Measure the voltage between the luggage compartment lid release switch C534-1, circuit 1523 (DG), harness side and ground.</li> </ul>  <p>N0027093</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>E7</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 2 (7.5A) is OK. If OK, REPAIR the circuit for an open. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<b>E7 CHECK THE LUGGAGE COMPARTMENT LID RELEASE SWITCH</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the luggage compartment lid release switch C534-1, circuit 1523 (DG), harness side and the luggage compartment lid release switch C534-2, circuit 26 (WH/VT), harness side.</li> </ul>  <p>N0079444</p> <ul style="list-style-type: none"> <li>• <b>Does the luggage compartment lid latch release?</b></li> </ul>	<p><b>Yes</b> INSTALL a new luggage compartment lid release switch. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>E8</u> .</p>
<b>E8 CHECK THE LUGGAGE COMPARTMENT LID RELEASE INPUT CIRCUIT FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between the DDM C501a-12, circuit 26 (WH/VT), harness side and the luggage compartment lid release switch C534-2, circuit 26 (WH/VT), harness side; and between the DDM C501a-12, circuit 26 (WH/VT), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>E14</u> .</p> <p><b>No</b> REPAIR circuit 26 (WH/VT) for an open or short to ground. TEST the system for normal operation.</p>

 <p>N0027095</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the DDM and the luggage compartment lid release switch, and greater than 10,000 ohms between the DDM and ground?</li> </ul>	
<b>E9 CHECK FOR A SHORT TO VOLTAGE TO THE LUGGAGE COMPARTMENT LID LATCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Luggage Compartment Lid Latch C430.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the luggage compartment lid latch C430-2, circuit 84 (VT/YE), harness side and ground.</li> </ul>  <p>N0079448</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> GO to <b>E10</b> .</p> <p><b>No</b> GO to <b>E11</b> .</p>
<b>E10 CHECK THE LUGGAGE COMPARTMENT LID RELEASE OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501b.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the luggage compartment lid latch C430-2, circuit 84 (VT/YE), harness side and ground.</li> </ul>  <p>N0079448</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 84 (VT/YE) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <b>E14</b> .</p>

<b>E11 CHECK FOR VOLTAGE TO THE LUGGAGE COMPARTMENT LID LATCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Unlock the doors with the door lock control switch.</li> <li>• <b>NOTE:</b> The DDM only supplies voltage to the luggage compartment lid latch momentarily. It is important to monitor the meter while pressing the luggage compartment lid release switch.</li> <li>• While pressing the luggage compartment lid release switch, measure the voltage between the luggage compartment lid latch C430-2, circuit 84 (VT/YE), harness side and ground.</li> </ul>  <p>N0079448</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage momentarily greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>E13</u> .</p> <p><b>No</b> GO to <u>E12</u> .</p>
<b>E12 CHECK THE LUGGAGE COMPARTMENT LID RELEASE OUTPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: DDM C501b.</li> <li>• Measure the resistance between the luggage compartment lid release solenoid C430-2, circuit 84 (VT/YE), harness side and the DDM C501b-12, circuit 84 (VT/YE), harness side.</li> </ul>  <p>N0027098</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>E14</u> .</p> <p><b>No</b> REPAIR circuit 84 (VT/YE) for an open. TEST the system for normal operation.</p>
<b>E13 CHECK THE LUGGAGE COMPARTMENT LID LATCH GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the luggage compartment lid release solenoid C430-3, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new luggage compartment lid latch. REFER to <u>Luggage Compartment Lid Latch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST</p>

 <p>N0079447</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	the system for normal operation.
<b>E14 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test F: The Luggage Compartment Lid Release Is Inoperative/Does Not Operate Correctly-With Police Package

Refer to Wiring Diagrams Cell [113](#) , Luggage Compartment for schematic and connector information.

#### Normal Operation

Vehicles equipped with the police package have 2 luggage compartment lid release switches, one located on the instrument panel and one located on the LH door trim panel. The instrument panel switch is supplied voltage through 1 of the 2 circuits. One of the circuits is only supplied voltage any time the accessory delay relay is active and the other has voltage at all times. When the luggage compartment lid release switch is pressed, the switch closes and supplies voltage to the luggage compartment lid latch releasing the luggage compartment lid. The luggage compartment lid latch has a dedicated ground circuit.

#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Luggage compartment lid release solenoid (part of the luggage compartment lid latch)
- Luggage compartment lid release switch

### PINPOINT TEST F: THE LUGGAGE COMPARTMENT LID RELEASE IS INOPERATIVE/DOES NOT OPERATE CORRECTLY - WITH POLICE PACKAGE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

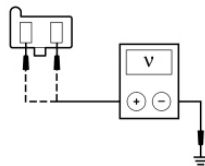
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
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**F1 CHECK FOR VOLTAGE TO THE INOPERATIVE LUGGAGE COMPARTMENT LID RELEASE SWITCH**

- Disconnect: Suspect Luggage Compartment Lid Release Switch.
- Ignition ON.
- Measure the voltage between the luggage compartment lid release switch, harness side and ground as follows:

Suspect Switch	Connector-Pin	Circuit
Driver door	C534-1	193 (YE/LG)
Instrument panel (voltage at all times)	C2203-2	517 (BK/WH)
Instrument panel (voltage in RUN/ACC)	C2204-2	193 (YE/LG)



N0107387

- Is the voltage greater than 10 volts?

**Yes**  
GO to **F2** .

**No**  
REPAIR the circuit in question for an open. TEST the system for normal operation.

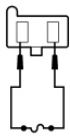
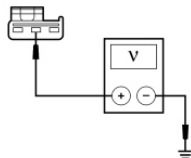
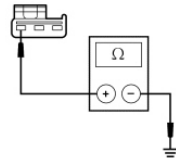
**F2 CHECK THE LUGGAGE COMPARTMENT LID RELEASE SWITCH FOR CORRECT OPERATION**

- **NOTE:** If the fuse in the jumper wire fails, repair circuit 84 (VT/YE) for a short to ground.
- Connect a fused jumper wire between the luggage compartment lid release switch terminals, harness side as follows:

Suspect Switch	Connector-Pin/ Circuit	Connector-Pin/ Circuit
Driver door	C534-1 193 (YE/LG)	C534-2 84 (VT/YE)
Instrument panel (voltage	C2203-2	C2203-1

**Yes**  
INSTALL a new luggage compartment lid release switch. TEST the system for normal operation.

**No**  
LEAVE the jumper wire connected. GO to **F3** .

<table border="1"> <tr> <td>at all times)</td><td>517 (BK/WH)</td><td>84 (VT/YE)</td></tr> <tr> <td>Instrument panel (voltage in RUN/ACC)</td><td>C2204-2 193 (YE/LG)</td><td>C2204-1 84 (VT/YE)</td></tr> </table>	at all times)	517 (BK/WH)	84 (VT/YE)	Instrument panel (voltage in RUN/ACC)	C2204-2 193 (YE/LG)	C2204-1 84 (VT/YE)		
at all times)	517 (BK/WH)	84 (VT/YE)						
Instrument panel (voltage in RUN/ACC)	C2204-2 193 (YE/LG)	C2204-1 84 (VT/YE)						
 <p>N0079444</p>								
<ul style="list-style-type: none"> <li>Does the luggage compartment lid release?</li> </ul>								
<b>F3 CHECK FOR VOLTAGE TO THE LUGGAGE COMPARTMENT LID LATCH</b>								
<ul style="list-style-type: none"> <li>Disconnect: Luggage Compartment Lid Release Solenoid C430.</li> <li>Measure the voltage between the luggage compartment lid latch C430-2, circuit 84 (VT/YE), harness side and ground.</li> </ul>		<p><b>Yes</b> GO to <b>F4</b> .</p> <p><b>No</b> REPAIR circuit 84 (VT/YE) for an open. TEST the system for normal operation.</p>						
 <p>N0079448</p>								
<ul style="list-style-type: none"> <li>Is the voltage greater than 10 volts?</li> </ul>								
<b>F4 CHECK THE LUGGAGE COMPARTMENT LID LATCH GROUND CIRCUIT FOR AN OPEN</b>								
<ul style="list-style-type: none"> <li>Disconnect: Negative Battery Cable.</li> <li>Measure the resistance between the luggage compartment lid release solenoid C430-3, circuit 57 (BK), harness side and ground.</li> </ul>		<p><b>Yes</b> INSTALL a new luggage compartment lid latch. REFER to <u>Luggage Compartment Lid Latch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>						
 <p>N0079447</p>								
<ul style="list-style-type: none"> <li>Is the resistance less than 5 ohms?</li> </ul>								

**Pinpoint Test G: The Doors Do Not Lock/Unlock Using The Keyless Entry Keypad**

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

**Normal Operation**

The Driver Door Module (DDM) monitors for a ground signal on the keyless entry keypad signal input circuits. When an individual keypad button is touched, an individual or combination of the input circuits is routed to ground. The DDM then determines which button was touched based on which circuit(s) are grounded. The keypad has a dedicated ground circuit. Once the DDM determines that the 5-digit personal entry code, or the factory set 5-digit entry code has been entered on the keypad, the DDM then unlocks the driver door.

To unlock all the doors, the 3/4 button must be pressed within 5 seconds of the 5-digit code being entered.

To release the luggage compartment lid, the 5/6 button must be pressed within 5 seconds of the 5-digit code being entered.

To lock all the doors, the 5-digit code does not need to be entered. Press the 7/8 and 9/0 buttons at the same time.

The keyless entry keypad has an anti-scan feature to help prevent theft. If a valid 5-digit code is not entered within 7 attempts (35 consecutive button presses), the keyless entry keypad will go into anti-scan. In anti-scan mode, the keypad illumination will flash and all input will be ignored except for pressing the 7/8 and 9/0 buttons, which will lock all doors.

- DTC B2695 (Keypad\_A Switch Circuit Failure) - a continuous and on-demand DTC that sets when the DDM detects a short to ground on the keypad input circuit. This DTC may also set if any keyless entry keypad button is pressed for longer than 2 minutes.
- DTC B2696 (Keypad\_B Switch Circuit Failure) - a continuous and on-demand DTC that sets when the DDM detects a short to ground on the keypad input circuit. This DTC may also set if any keyless entry keypad button is pressed for longer than 2 minutes.
- DTC B2697 (Keypad\_C Switch Circuit Failure) - a continuous and on-demand DTC that sets when the DDM detects a short to ground on the keypad input circuit. This DTC may also set if any keyless entry keypad button is pressed for longer than 2 minutes.

**This pinpoint test is intended to diagnose the following:**

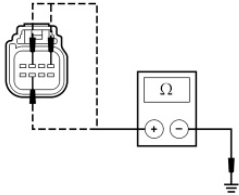
- Wiring, terminals or connectors
- Keyless entry keypad
- DDM

**PINPOINT TEST G: THE DOORS DO NOT LOCK/UNLOCK USING THE KEYLESS ENTRY KEYPAD**

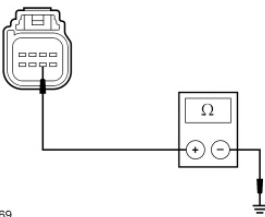
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

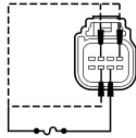
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
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<b>G1 CHECK THE DDM KEYCODE PID</b>									
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Observe the DDM PID (KEYCODE). Read and record the 5-digit factory set entry code.</li> <li>• Enter the 5-digit factory set entry code on the keyless entry keypad.</li> <li>• <b>Do the doors unlock?</b></li> </ul>	<p><b>Yes</b> The system is operating as designed. INFORM the customer of the correct system operation.</p> <p><b>No</b> GO to <u>G2</u> .</p>								
<b>G2 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>									
<ul style="list-style-type: none"> <li>• Check for recorded DDM DTCs from the self-test.</li> <li>• <b>Is DTC B2695, DTC B2696, or DTC B2697 recorded?</b></li> </ul>	<p><b>Yes</b> GO to <u>G3</u> .</p> <p><b>No</b> GO to <u>G5</u> .</p>								
<b>G3 REPEAT THE DDM SELF-TEST</b>									
<ul style="list-style-type: none"> <li>• Disconnect: Keyless Entry Keypad C530.</li> <li>• Clear the DTCs, then repeat the DDM self-test.</li> <li>• <b>Is DTC B2695, DTC B2696, or DTC B2697 recorded?</b></li> </ul>	<p><b>Yes</b> GO to <u>G4</u> .</p> <p><b>No</b> INSTALL a new keyless entry keypad. REFER to <u>Keyless Entry Keypad</u> in this section. TEST the system for normal operation.</p>								
<b>G4 CHECK THE KEYLESS ENTRY KEYPAD INPUT CIRCUITS FOR A SHORT TO GROUND</b>									
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between the keypad, harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C530-1</td><td>78 (LB/YE)</td></tr> <tr> <td>C530-3</td><td>79 (LG/RD)</td></tr> <tr> <td>C530-7</td><td>121 (YE/BK)</td></tr> </tbody> </table>  <p>N0104473</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	Connector-Pin	Circuit	C530-1	78 (LB/YE)	C530-3	79 (LG/RD)	C530-7	121 (YE/BK)	<p><b>Yes</b> GO to <u>G10</u> .</p> <p><b>No</b> REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p>
Connector-Pin	Circuit								
C530-1	78 (LB/YE)								
C530-3	79 (LG/RD)								
C530-7	121 (YE/BK)								
<b>G5 CHECK THE DDM KEY_PAD PID</b>									



<ul style="list-style-type: none"><li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li><li>• Press each keyless entry keypad button while observing the DDM PID (KEY_PAD).</li><li>• <b>Does the PID display the correct values?</b></li></ul>	<b>Yes</b> GO to <u>G10</u> .  <b>No</b> GO to <u>G6</u> .												
<b>G6 CHECK THE KEYLESS ENTRY KEYPAD GROUND CIRCUIT FOR AN OPEN</b>													
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Negative Battery Cable.</li><li>• Disconnect: Keyless Entry Keypad C530.</li><li>• Measure the resistance between the keyless entry keypad C530-6, circuit 57 (BK), harness side and ground.</li></ul> <div><p>N0072769</p></div> <ul style="list-style-type: none"><li>• <b>Is the resistance less than 5 ohms?</b></li></ul>	<b>Yes</b> GO to <u>G7</u> .  <b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.												
<b>G7 CHECK THE KEYLESS ENTRY KEYPAD</b>													
<ul style="list-style-type: none"><li>• Connect: Negative Battery Cable.</li><li>• Connect a fused jumper wire between the keyless entry keypad harness side, while monitoring the DDM PID (KEY_PAD) as follows:</li></ul> <table><tr><th>Keyless Entry Keypad Connector-Pin/ Circuit</th><th>Keyless Entry Keypad Connector-Pin/ Circuit</th><th>DDM PID (KEY_PAD) Value</th></tr><tr><td>C530-1 78 (LB/YE)</td><td>C530-6 57 (BK)</td><td>1/2</td></tr><tr><td>C530-3 79 (LG/RD)</td><td>C530-6 57 (BK)</td><td>7/8</td></tr><tr><td>C530-7 121 (YE/BK)</td><td>C530-6 57 (BK)</td><td>9/0</td></tr></table>	Keyless Entry Keypad Connector-Pin/ Circuit	Keyless Entry Keypad Connector-Pin/ Circuit	DDM PID (KEY_PAD) Value	C530-1 78 (LB/YE)	C530-6 57 (BK)	1/2	C530-3 79 (LG/RD)	C530-6 57 (BK)	7/8	C530-7 121 (YE/BK)	C530-6 57 (BK)	9/0	<b>Yes</b> INSTALL a new keyless entry keypad. REFER to <u>Keyless Entry Keypad</u> in this section.  <b>No</b> GO to <u>G8</u> .
Keyless Entry Keypad Connector-Pin/ Circuit	Keyless Entry Keypad Connector-Pin/ Circuit	DDM PID (KEY_PAD) Value											
C530-1 78 (LB/YE)	C530-6 57 (BK)	1/2											
C530-3 79 (LG/RD)	C530-6 57 (BK)	7/8											
C530-7 121 (YE/BK)	C530-6 57 (BK)	9/0											



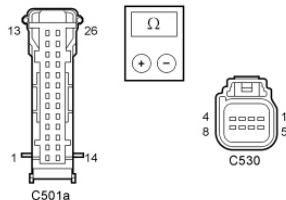
N0104245

- Does the PID display the correct values?

### G8 CHECK THE KEYLESS ENTRY KEYPAD INPUT CIRCUITS FOR AN OPEN

- Ignition OFF.
- Disconnect: DDM C501a.
- Measure the resistance between the DDM , harness side and the keyless entry keypad, harness side as follows:

DDM Connector-Pin	Keyless Entry Keypad Connector-Pin	Circuit
C501a-7	C530-1	78 (LB/YE)
C501a-2	C530-3	79 (LG/RD)
C501a-3	C530-7	121 (YE/BK)



N0107388

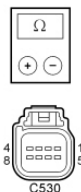
- Are the resistances less than 5 ohms?

### G9 CHECK THE KEYLESS ENTRY KEYPAD INPUT CIRCUITS FOR A SHORT TO EACH OTHER

- Measure the resistance between the keypad, harness side as follows:

Keypad Connector-Pin	Circuits	Keypad Connector-Pin
C530-1	78 (LB/YE) and 79 (LG/RD)	C530-3
C530-1	78 (LB/YE) and 121 (YE/BK)	C530-7

**Yes**GO to G9 .**No**REPAIR the circuit in question.  
TEST the system for normal operation.**Yes**GO to G10 .**No**REPAIR the circuit in question.  
TEST the system for normal operation.

C530-3	79 (LG/RD) and 121 (YE/BK)	C530-7
 <p>N0094431</p>		
<ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>		
<b>G10 CHECK FOR CORRECT DDM OPERATION</b>		
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>		<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test H: The Keyless Entry Keypad Illumination Is Inoperative/Does Not Operate Correctly

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

#### Normal Operation

The keyless entry keypad illumination is supplied voltage at all times from the Central Junction Box (CJB) Fuse 2 (7.5A). When the Driver Door Module (DDM) detects a keyless entry keypad button is pressed, the DDM supplies ground to the keyless entry keypad illumination.

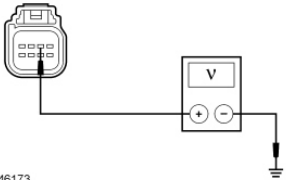
**This pinpoint test is intended to diagnose the following:**

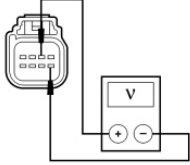
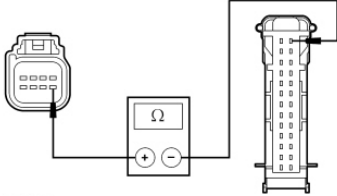
- Fuse
- Wiring, terminals or connectors
- Keyless entry keypad
- DDM

### PINPOINT TEST H: THE KEYLESS ENTRY KEYPAD ILLUMINATION IS INOPERATIVE/DOES NOT OPERATE CORRECTLY

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>H1 CHECK THE KEYLESS ENTRY KEYPAD</b>	

<ul style="list-style-type: none"> <li>Observe the door locks while pressing the keyless entry keypad 7/8 and 9/0 buttons.</li> <li><b>Do the doors lock?</b></li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> GO to Pinpoint Test G .</p>
<b>H2 CHECK THE KEYLESS ENTRY KEYPAD ILLUMINATION</b>	
<ul style="list-style-type: none"> <li>Observe the keyless entry keypad illumination.</li> <li><b>Is the keyless entry keypad illumination always on?</b></li> </ul>	<p><b>Yes</b> GO to <u>H3</u> .</p> <p><b>No</b> GO to <u>H4</u> .</p>
<b>H3 CHECK THE KEYLESS ENTRY KEYPAD ILLUMINATION CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: DDM C501a.</li> <li>Observe the keyless entry keypad illumination.</li> <li><b>Is the keyless entry keypad illumination on?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 66 (LB) for a short to ground. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H7</u> .</p>
<b>H4 CHECK FOR VOLTAGE TO THE KEYPAD</b>	
<ul style="list-style-type: none"> <li>Disconnect: Keyless Entry Keypad C530.</li> <li>Measure the voltage between the keyless entry keypad C530-2, circuit 1523 (DG), harness side and ground.</li> </ul>  <p>A0046173</p> <ul style="list-style-type: none"> <li><b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>H5</u> .</p> <p><b>No</b> REPAIR circuit 1523 (DG) for an open. TEST the system for normal operation.</p>
<b>H5 CHECK FOR DDM OUTPUT</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>Active command the DDM keypad illumination PID (LIGHT) on.</li> <li>Measure the voltage between the keyless entry keypad C530-2, circuit 1523 (DG), harness side, and the keyless entry keypad C530-5, circuit 66 (LB), harness side.</li> </ul>	<p><b>Yes</b> INSTALL a new keyless entry keypad. REFER to <u>Keyless Entry Keypad</u> in this section.</p> <p><b>No</b> GO to <u>H6</u> .</p>

 <p>N0079451</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<b>H6 CHECK THE KEYLESS ENTRY KEYPAD ILLUMINATION CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between the keyless entry keypad C530-5, circuit 66 (LB), harness side and the DDM C501a-26, circuit 66 (LB), harness side.</li> </ul>  <p>N0027111</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>H7</u> .</p> <p><b>No</b> REPAIR circuit 66 (LB) for an open. TEST the system for normal operation.</p>
<b>H7 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test I: The Remote Keyless Entry (RKE) Transmitter Is Inoperative

Refer to Wiring Diagrams Cell 117 , Remote Keyless Entry and Alarm for schematic and connector information.

#### Normal Operation

Remote locking and unlocking of the doors, releasing the luggage compartment lid, and activation of the panic alarm is accomplished by the Driver Door Module (DDM) receiving a command message from the Remote Keyless Entry (RKE) transmitter. The DDM processes the command and energizes the appropriate relays to lock or unlock the doors, release the luggage compartment lid, or sends a message over the Standard Corporate Protocol (SCP) network to the Lighting Control Module (LCM) to activate the parking lamps and horn for the panic alarm.

The RKE transmitters and DDM also utilize a rolling code to prevent the code from being "captured" by a code grabber. The system advances the counter in the RKE transmitter and DDM every time an RKE transmitter button is pressed.

DTC Description	Fault Trigger Conditions
• B1148 - Radio Frequency Power Output Circuit Short to Ground	A continuous DTC that sets when the DDM detects the radio frequency power output circuit is shorted to ground.
• B1149 - Radio Frequency Enable Output Circuit Short to Battery	A continuous DTC that sets when the DDM detects the radio frequency enable output circuit is shorted to voltage.
• B1150 - Radio Frequency Enable Output Circuit Short to Ground	A continuous DTC that sets when the DDM detects the radio frequency enable output circuit is shorted to ground.
• B1151 - Radio Frequency AM/FM Signal Key Select Output Circuit Short to Ground	A continuous DTC that sets when the DDM detects the radio frequency AM/FM signal key select output circuit is shorted to ground.
• B1152 - Radio Frequency AM/FM Signal Key Select Output Circuit Short to Battery	A continuous DTC that sets when the DDM detects the radio frequency AM/FM signal key select output circuit is shorted to voltage.
• B2425 - Remote Keyless Entry Out of Synchronization	A continuous DTC that sets when the DDM detects the rolling counter received from an RKE transmitter is 1,024 times greater than the rolling counter stored in the module.

**This pinpoint test is intended to diagnose the following:**

- RKE transmitter battery
- RKE transmitter button pressed a substantial amount of times while outside the range of the vehicle
- RKE transmitter programming
- RKE transmitter
- Tire Pressure Monitoring System (TPMS)/ RKE antenna
- DDM

#### **PINPOINT TEST I: THE RKE TRANSMITTER IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

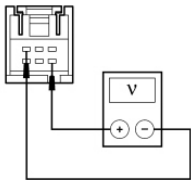
**NOTE:** Aftermarket or dealer-installed systems may adversely affect the RKE system operation. These systems should be disconnected before diagnosing any RKE concerns.

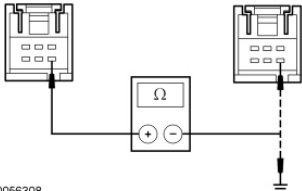
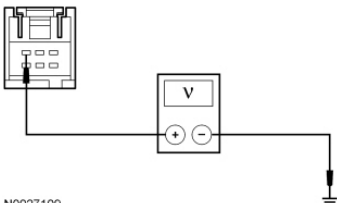
Test Step	Result / Action to Take
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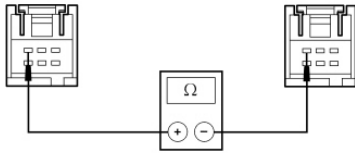
<b>I1 CHECK FOR THE CORRECT RKE TRANSMITTERS</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> Make sure the RKE transmitters are those provided with the OEM system and not from an aftermarket system, or a dealer-installed system that may have been installed on the vehicle.</li> <li>• Check that the correct RKE transmitters are used with the vehicle. Compare the RKE transmitters with the one shown in <u>Handles, Locks, Latches and Entry Systems</u> in the Description and Operation portion of this section.</li> <li>• <b>Are the correct RKE transmitters present?</b></li> </ul>	<p><b>Yes</b> GO to <u>I2</u> .</p> <p><b>No</b> The system cannot be tested without the correct RKE transmitters. <b>INFORM</b> the customer that the correct RKE transmitters must be present to proceed with diagnosis of the system.</p>
<b>I2 CHECK THE FUNCTIONALITY OF ALL RKE TRANSMITTERS</b>	
<ul style="list-style-type: none"> <li>• Press each button on a transmitter.</li> <li>• <b>Do any buttons operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>Pinpoint Test J</u> .</p> <p><b>No</b> GO to <u>I3</u> .</p>
<b>I3 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check the recorded results from the DDM self-test.</li> <li>• <b>Is continuous DTC B1148, DTC B1149, DTC B1150, DTC B1151, DTC B1152, or DTC B2425 present?</b></li> </ul>	<p><b>Yes</b> For DTC B2425, GO to <u>I4</u> .</p> <p>For DTC B1148, DTC B1149, DTC B1150, DTC B1151 or DTC B1152, GO to <u>I12</u> .</p> <p><b>No</b> GO to <u>I8</u> .</p>
<b>I4 RESYNCHRONIZE THE INOPERATIVE RKE TRANSMITTER</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Press any button on the inoperative RKE transmitter 4 times consecutively within 30 seconds.</li> <li>• <b>Does the RKE transmitter operate correctly now?</b></li> </ul>	<p><b>Yes</b> The transmitter is now synchronized. <b>CLEAR</b> the DTCs. <b>REPEAT</b> the self-test.</p> <p><b>No</b> GO to <u>I5</u> .</p>
<b>I5 CHECK FOR A SECOND RKE TRANSMITTER</b>	
<ul style="list-style-type: none"> <li>• Check for another RKE transmitter that operates with the vehicle.</li> <li>• <b>Is there another RKE transmitter that operates with the vehicle?</b></li> </ul>	<p><b>Yes</b> GO to <u>I6</u> .</p> <p><b>No</b> GO to <u>I7</u> .</p>
<b>I6 RESYNCHRONIZE THE INOPERATIVE RKE TRANSMITTER USING THE SECOND RKE TRANSMITTER</b>	
<ul style="list-style-type: none"> <li>• Press any button on the operational RKE transmitter.</li> </ul>	<p><b>Yes</b> The RKE transmitter is now synchronized. <b>CLEAR</b> the DTCs. <b>REPEAT</b> the self-test.</p>

<ul style="list-style-type: none"> <li>• Within 30 seconds, press a button on the inoperative RKE transmitter.</li> <li>• Check the inoperative RKE transmitter for correct operation.</li> <li>• <b>Does the inoperative RKE transmitter operate now?</b></li> </ul>	<b>No</b> GO to <u>I7</u> .
<b>I7 PROGRAM THE INOPERATIVE RKE TRANSMITTER OR ALL THE RKE TRANSMITTERS</b>	
<ul style="list-style-type: none"> <li>• Program the inoperative RKE transmitter individually using a scan tool or program all RKE transmitters using the manual key cycle method. Refer to <u>Remote Keyless Entry (RKE) Transmitter Programming</u> in this section.</li> <li>• <b>Does the inoperative RKE transmitter(s) operate now?</b></li> </ul>	<b>Yes</b> The RKE transmitter(s) is now synchronized. INFORM the customer that any RKE transmitters not present need to be programmed. CLEAR the DTCs. REPEAT the self-test.  <b>No</b> GO to <u>I8</u> .
<b>I8 MAKE SURE THE RKE TRANSMITTER SIGNAL IS BEING RECEIVED</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Remote Keyless Entry.</li> <li>• <b>NOTE:</b> The remote keyless entry test is accessed through the scan tool by selecting Toolbox, Body, Security.</li> <li>• Monitor the RKE Transmitter Identification Code (TIC) through the scan tool menus.</li> <li>• Verify the RKE transmitter signal is being received. Press a button on the RKE transmitter while observing the scan tool.</li> <li>• <b>Does the TIC show up on the scan tool screen when a button is pressed?</b></li> </ul>	<b>Yes</b> GO to <u>I9</u> .  <b>No</b> GO to <u>I10</u> .
<b>I9 CHECK IF THE RKE TRANSMITTERS ARE PROGRAMMED</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Remote Keyless Entry.</li> <li>• Monitor the RKE transmitter TIC data through the scan tool menus.</li> <li>• Press a button on the RKE transmitter while observing the scan tool.</li> <li>• <b>Does the TIC displayed after pressing a button on the RKE transmitter match any of the TICs stored in memory?</b></li> </ul>	<b>Yes</b> GO to <u>I20</u> .  <b>No</b> PROGRAM the inoperative RKE transmitter individually using a scan tool or PROGRAM all the RKE transmitters using the manual key cycle method. REFER to <u>Remote Keyless Entry (RKE) Transmitter Programming</u> in this section. INFORM the customer that any RKE transmitters not present need to be programmed. TEST the system for normal operation.
<b>I10 CHECK FOR NORMAL OPERATION WITH A KNOWN GOOD RKE TRANSMITTER</b>	
	<b>Yes</b> GO to <u>I11</u> .



<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Remote Keyless Entry.</li> <li>• Monitor the RKE transmitter TIC data through the scan tool menus.</li> <li>• Using the customer's second RKE transmitter or a known good RKE transmitter that is correct for the vehicle (and programmed to the vehicle), verify the RKE transmitter signal is being received.</li> <li>• <b>Does the TIC show up on the scan tool when a button is pressed on the RKE transmitter?</b></li> </ul>	<p><b>No</b> GO to <a href="#">I12</a> .</p>
<p><b>I11 CHECK THE INOPERATIVE RKE TRANSMITTER BATTERY</b></p>	
<ul style="list-style-type: none"> <li>• Using a thin coin, open the inoperative RKE transmitter.</li> <li>• Do not clean off any grease from the battery terminals on the back surface of the circuit board.</li> <li>• Verify the correct battery is used (CR2032).</li> <li>• Remove the RKE transmitter battery and measure the voltage.</li> <li>• <b>Is the voltage greater than 2.5 volts?</b></li> </ul>	<p><b>Yes</b> REPLACE the inoperative RKE transmitter. PROGRAM the inoperative RKE transmitter individually using a scan tool or PROGRAM all RKE transmitters using the manual key cycle method. REFER to <a href="#">Remote Keyless Entry (RKE) Transmitter Programming</a> in this section. INFORM the customer that any RKE transmitters not present need to be programmed. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new battery. DO NOT reprogram the RKE transmitters (weak or dead batteries do not erase TICs from memory). TEST the system for normal operation.</p>
<p><b>I12 CHECK FOR VOLTAGE TO THE TPMS / RKE ANTENNA</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: TPMS / RKE Antenna C3183.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the TPMS / RKE antenna C3183-4, circuit 2308 (RD/WH), harness side and the TPMS / RKE antenna C3183-3, circuit 2307 (BK/WH), harness side.</li> </ul>  <p style="text-align: center;">N10079452</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">I16</a> .</p> <p><b>No</b> GO to <a href="#">I13</a> .</p>
<p><b>I13 CHECK THE TPMS / RKE ANTENNA VOLTAGE CIRCUIT FOR AN OPEN OR SHORT TO GROUND</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501c.</li> <li>• Measure the resistance between the TPMS / RKE antenna C3183-4, circuit 2308 (RD/WH), harness side and the DDM C501c-4, circuit 2308 (RD/WH), harness side; and between the TPMS / RKE antenna C3183-4, circuit 2308 (RD/WH), harness side and ground.</li> </ul>  <p>N0056308</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the TPMS / RKE antenna and the DDM , and greater than 10,000 ohms between the TPMS / RKE antenna and ground?</li> </ul>	<p><b>Yes</b> GO to <u>I14</u> .</p> <p><b>No</b> REPAIR circuit 2308 (RD/WH) for an open or short to ground. TEST the system for normal operation.</p>
<b>I14 CHECK THE TPMS / RKE ANTENNA GROUND CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the TPMS / RKE antenna C3183-3, circuit 2307 (BK/WH), harness side and ground.</li> </ul>  <p>N0027109</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 2307 (BK/WH) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>I15</u> .</p>
<b>I15 CHECK THE TPMS / RKE ANTENNA GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the TPMS / RKE antenna C3183-3, circuit 2307 (BK/WH), harness side and the DDM C501c-3, circuit 2307 (BK/WH), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>I20</u> .</p> <p><b>No</b> REPAIR circuit 2307 (BK/WH) for an open. TEST the system for normal operation.</p>

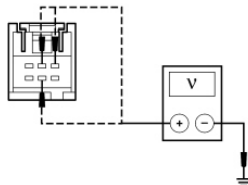


- Is the resistance less than 5 ohms?

# **I16 CHECK THE TPMS / RKE ANTENNA COMMUNICATION CIRCUITS FOR A SHORT TO VOLTAGE**

- Ignition OFF.
- Disconnect: DDM C501c.
- Ignition ON.
- Measure the voltage between the TPMS / RKE antenna connector, harness side and ground as follows.

Connector-Pin	Circuit
C3183-1	2305 (VT/LB)
C3183-2	2306 (GY/RD)
C3183-5	2309 (LB/BK)



- Is any voltage present?

# **I17 CHECK THE TPMS / RKE ANTENNA COMMUNICATION CIRCUITS FOR AN OPEN**

- Measure the resistance between the TPMS / RKE antenna connector, harness side and the DDM connector, harness side as follows.

TPMS / RKE Antenna Connector-Pin	DDM Connector-Pin	Circuit
C3183-1	C501c-1	2305 (VT/LB)
C3183-2	C501c-2	

**Yes**

REPAIR the circuit in question. TEST the system for normal operation.

**No**

GO to **I17** .

**Yes**

GO to **I18** .

**No**

REPAIR the circuit in question. TEST the system for normal operation.

		2306 (GY/RD)
C3183-5	C501c-5	2309 (LB/BK)

Ω

+

-

3

6

1

4

C3183

3

6

1

4

C501c

N0107390

• Are the resistances less than 5 ohms?

I18 CHECK THE TPMS / RKE ANTENNA COMMUNICATION CIRCUITS FOR A SHORT TO GROUND

• Measure the resistance between the TPMS / RKE antenna connector and ground as follows.

Connector-Pin	Circuit
C3183-1	2305 (VT/LB)
C3183-2	2306 (GY/RD)
C3183-5	2309 (LB/BK)

Ω

+

-

3

6

1

4

3

6

1

4

N0107391

• Are the resistances greater than 10,000 ohms?

I19 TEST THE SYSTEM WITH A KNOWN GOOD TPMS / RKE ANTENNA

• Ignition OFF.

• Install a known good TPMS / RKE antenna.

• Ignition ON.

• Test the system for normal operation.

• Does the system operate correctly?

Yes

The system is OK. INSTALL a new TPMS / RKE antenna. REFER to Antenna in this section.

No

REMOVE the known good antenna. GO to I20 .

I20 CHECK FOR CORRECT DDM OPERATION

<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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### Pinpoint Test J: An Individual Button/Feature Is Inoperative From The Remote Keyless Entry (RKE) Transmitter

Refer to Wiring Diagrams Cell 44 , Horn/Cigar Lighter for schematic and connector information.

#### Normal Operation

Remote locking and unlocking of the doors, releasing the luggage compartment lid, and activation of the panic alarm is accomplished by the Driver Door Module (DDM) receiving a command message from the Remote Keyless Entry (RKE) transmitter. The DDM processes the command and energizes the appropriate relays to lock or unlock the doors, releases the luggage compartment lid, or sends a message over the Standard Corporate Protocol (SCP) network to the Lighting Control Module (LCM) to activate the parking lamps and horn for the panic alarm.

The LCM will disable the PANIC feature if the ignition key is in any position other than OFF or LOCK.

#### This pinpoint test is intended to diagnose the following:

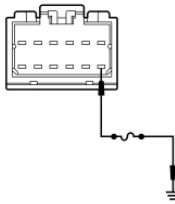
- Wiring, terminals or connectors
- Door locks
- Horn system
- Luggage compartment lid release
- Parking lamps
- RKE transmitter
- LCM
- DDM

#### PINPOINT TEST J: AN INDIVIDUAL BUTTON/FEATURE IS INOPERATIVE FROM THE RKE TRANSMITTER

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>J1 CHECK THE COMPLETE FUNCTIONALITY OF THE RKE TRANSMITTER</b>	
<ul style="list-style-type: none"> <li>• Press each button on the transmitter.</li> </ul>	<p><b>Yes</b> <u>GO to Pinpoint Test I</u> .</p> <p><b>No</b></p>

<ul style="list-style-type: none"> <li>• Is the RKE transmitter completely inoperative?</li> </ul>	GO to <u>J2</u> .
<b>J2 CHECK THE PANIC FEATURE FROM THE RKE TRANSMITTER</b>	
<ul style="list-style-type: none"> <li>• Press the panic button on the RKE transmitter.</li> <li>• Is PANIC the inoperative button?</li> </ul>	<b>Yes</b> GO to <u>J5</u> .  <b>No</b> GO to <u>J3</u> .
<b>J3 CHECK THE DOOR LOCK OPERATION</b>	
<ul style="list-style-type: none"> <li>• Press the lock and unlock buttons on the interior door lock control switch.</li> <li>• Do the doors lock and unlock?</li> </ul>	<b>Yes</b> GO to <u>J4</u> .  <b>No</b> GO to <u>Symptom Chart - Electrical</u> .
<b>J4 CHECK THE LUGGAGE COMPARTMENT LID RELEASE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Press the luggage compartment lid release switch on the driver door panel.</li> <li>• Does the luggage compartment lid release?</li> </ul>	<b>Yes</b> REPLACE the inoperative RKE transmitter. PROGRAM the inoperative RKE transmitter individually using a scan tool or PROGRAM all RKE transmitters using the manual key cycle method. REFER to <u>Remote Keyless Entry (RKE) Transmitter Programming</u> in this section. INFORM the customer that any RKE transmitters not present need to be programmed. TEST the system for normal operation.  <b>No</b> GO to <u>Pinpoint Test E</u> .
<b>J5 CHECK THE PANIC ALARM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>NOTE:</b> Make sure the key is in the OFF position. The panic alarm will not operate with the key in any other position.</li> <li>• Press the panic button on the RKE transmitter.</li> <li>• Does the panic alarm operate?</li> </ul>	<b>Yes</b> The system is working normally. INFORM the customer of the correct operation of the panic alarm.  <b>No</b> GO to <u>J6</u> .
<b>J6 CHECK THE DDM PID (TNSMT_CMD)</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM PID (TNSMT_CMD) while pressing the PANIC button on the RKE transmitter.</li> <li>• Does the PID indicate PANIC?</li> </ul>	<b>Yes</b> GO to <u>J7</u> .  <b>No</b> REPLACE the inoperative RKE transmitter. PROGRAM the inoperative RKE transmitter individually using a scan tool or PROGRAM all RKE transmitters using the manual key cycle method. REFER to <u>Remote Keyless Entry (RKE) Transmitter Programming</u> in this section. INFORM the customer that any RKE transmitters not present need to be programmed. TEST

	the system for normal operation.
<b>J7 CHECK THE PARKING LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Turn the headlamp switch to the PARKLAMP position.</li> <li>• <b>Do the parking lamps illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>J8</u> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> .</p>
<b>J8 CHECK THE HORN OPERATION</b>	
<ul style="list-style-type: none"> <li>• Press the horn switch.</li> <li>• <b>Does the horn sound?</b></li> </ul>	<p><b>Yes</b> GO to <u>J9</u> .</p> <p><b>No</b> REFER to <u>Section 413-06</u> .</p>
<b>J9 ACTIVE COMMAND THE HORN TO SOUND</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Active command the LCM PID (HORN) ON and then OFF.</li> <li>• <b>Does the horn sound when active commanded?</b></li> </ul>	<p><b>Yes</b> GO to <u>J11</u> .</p> <p><b>No</b> GO to <u>J10</u> .</p>
<b>J10 CHECK THE HORN SIGNAL CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145b.</li> <li>• Connect a fused jumper wire between the LCM C2145b-7, circuit 1 (DB), harness side and ground.</li> </ul>  <p>N0079453</p> <ul style="list-style-type: none"> <li>• <b>Does the horn sound?</b></li> </ul>	<p><b>Yes</b> GO to <u>J12</u> .</p> <p><b>No</b> REPAIR circuit 1 (DB) for an open. TEST the system for normal operation.</p>
<b>J11 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b></p>

<ul style="list-style-type: none"> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
<b>J12 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test K: The Remote Keyless Entry (RKE) Transmitter Has Poor Range Performance

#### Normal Operation

Remote locking and unlocking of the doors, releasing the luggage compartment lid, and activation of the panic alarm is accomplished by the Driver Door Module (DDM) receiving a command message from the Remote Keyless Entry (RKE) transmitter. The DDM processes the command and energizes the appropriate relays to lock or unlock the doors, releases the luggage compartment lid, or sends a message over the Standard Corporate Protocol (SCP) network to the Lighting Control Module (LCM) to activate the parking lamps and horn for the panic alarm. The RKE transmitter has a normal operating range of 10 m (33 ft).

**This pinpoint test is intended to diagnose the following:**

- Aftermarket systems
- High power devices
- TV/radio transmission towers
- RKE transmitter
- RKE transmitter battery
- Tire Pressure Monitoring System (TPMS)/ RKE antenna

#### PINPOINT TEST K: THE RKE TRANSMITTER HAS POOR RANGE PERFORMANCE

Test Step	Result / Action to Take
<b>K1 CHECK FOR THE CORRECT RKE TRANSMITTERS</b>	
	<b>Yes</b>



<p><b>NOTE:</b> Make sure the RKE transmitters are those provided with the OEM system and not from an aftermarket system, or a dealer-installed system, that may have been installed on the vehicle.</p> <ul style="list-style-type: none"> <li>• Check that the correct RKE transmitters are used with the vehicle. Compare the RKE transmitters with the one shown in <u>Handles, Locks, Latches and Entry Systems</u> in the Description and Operation portion of this section.</li> <li>• <b>Are the correct RKE transmitters present?</b></li> </ul>	<p>GO to <u>K2</u> .</p> <p><b>No</b> The system cannot be tested without the correct RKE transmitters. INFORM the customer that the correct RKE transmitters must be present to proceed with diagnosis of the system.</p>
<b>K2 CHECK ALL RKE TRANSMITTERS FOR POOR RANGE PERFORMANCE</b>	
<p><b>NOTE:</b> The 10 m (33 ft) measurement of range is not the standard but is a guideline that clearly indicates a vehicle is experiencing poor range performance.</p> <ul style="list-style-type: none"> <li>• Check all RKE transmitters for poor range performance (less than 10 m [33 ft]).</li> <li>• <b>Do all RKE transmitters experience poor range performance?</b></li> </ul>	<p><b>Yes</b> GO to <u>K4</u> .</p> <p><b>No</b> GO to <u>K3</u> .</p>
<b>K3 CHECK THE BATTERY OF THE RKE TRANSMITTER WITH POOR RANGE</b>	
<ul style="list-style-type: none"> <li>• Using a thin coin, open the inoperative RKE transmitter.</li> <li>• Do not clean off any grease from the battery terminals on the back surface of the circuit board.</li> <li>• Verify the correct battery is used (CR2032).</li> <li>• Remove the RKE transmitter battery and measure the voltage.</li> <li>• <b>Is the voltage greater than 2.5 volts?</b></li> </ul>	<p><b>Yes</b> REPLACE the inoperative RKE transmitter. PROGRAM the inoperative RKE transmitter individually using a scan tool or PROGRAM all RKE transmitters using the manual key cycle method. REFER to <u>Remote Keyless Entry (RKE) Transmitter Programming</u> in this section. INFORM the customer that any RKE transmitters not present need to be programmed. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new battery. DO NOT reprogram the RKE transmitters (weak or dead batteries do not erase Transmitter Identification Codes (TICs) from memory). TEST the system for normal operation.</p>
<b>K4 CHECK THE LOCATION OF THE VEHICLE AND THE APPROACH ANGLES AROUND THE VEHICLE</b>	

<ul style="list-style-type: none"> <li>• Make sure the poor performance is consistent in nature and is not from one approaching angle.</li> <li>• If the vehicle is within 0.8 km (0.5 mile) of high-power devices or radio/TV towers, the operating distance of the RKE transmitters may be reduced.</li> <li>• <b>Is the poor range performance consistent around the vehicle?</b></li> </ul>	<p><b>Yes</b> INSTALL a new TPMS / RKE antenna. REFER to <u>Antenna</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. TEST the system for normal operation.</p>
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### Pinpoint Test L: The Autolock Does Not Operate Correctly

#### Normal Operation

The autolocking function automatically locks all doors when all of the following conditions are concurrently met during the current key cycle:

- All the doors are closed
- The autolocking function is active
- The ignition switch is in the RUN position
- The transmission is in a forward gear
- The vehicle speed exceeds 5 km/h (3 mph)

After the initial activation of autolocking and at least one door has been opened, autolocking is activated again if the following conditions are concurrently met:

- All the doors are closed
- The ignition switch is in the RUN position
- The transmission is in a forward gear
- The vehicle speed exceeds 5 km/h (3 mph)

The Driver Door Module (DDM) receives inputs from the ignition switch position, digital Transmission Range (TR) sensor, and the vehicle speed over the Standard Corporate Protocol (SCP) network. If the DDM does not receive or receives invalid data for vehicle speed from the Instrument Cluster (IC), it sets DTC U1041. If the DDM does not receive or receives invalid data for the TR sensor from the IC, it sets DTC U1059. The DDM also receives input from the door ajar switches, which are hardwired to the DDM.

**This pinpoint test is intended to diagnose the following:**

- Door ajar switch input
- Vehicle speed signal message from the IC
- Digital TR sensor message from the IC
- DDM

#### PINPOINT TEST L: THE AUTOLOCK DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
<b>L1 VERIFY THE AUTOLOCK FEATURE IS ENABLED</b>	

<ul style="list-style-type: none"> <li>• Verify the autolock feature is enabled. Refer to <u>Autolock and Auto-Unlock Programming</u> in this section.</li> <li>• <b>Is the autolock feature enabled?</b></li> </ul>	<p><b>Yes</b> GO to <u>L2</u> .</p> <p><b>No</b> ENABLE the autolock feature. REFER to <u>Autolock and Auto-Unlock Programming</u> in this section.</p>
<b>L2 CHECK THE COURTESY LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Open and close the doors while observing the courtesy lamp operation.</li> <li>• <b>Do the courtesy lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>L3</u> .</p> <p><b>No</b> REFER to <u>Section 417-02</u> .</p>
<b>L3 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check the recorded results from the DDM self-test.</li> <li>• <b>Is continuous DTC U1041 or DTC U1059 retrieved?</b></li> </ul>	<p><b>Yes</b> For DTC U1041, REFER to <u>Section 413-01</u> to diagnose the speedometer.</p> <p>For DTC U1059, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to diagnose the digital TR sensor.</p> <p>For all other DDM DTCs, REFER to DTC Charts.</p> <p><b>No</b> GO to <u>L4</u> .</p>
<b>L4 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test M: The Auto-Unlock Does Not Operate Correctly****Normal Operation**

The Driver Door Module (DDM) energizes the unlock relay based on input from the door ajar switches and the vehicle speed signal. The DDM unlocks the doors when the following conditions are met:

- The vehicle speed has exceeded 5 km/h (3 mph) then dropped to 0 km/h (0 mph).
- The key is turned to the OFF or ACC position.
- The LH front door is opened within 10 minutes of the key being turned to the OFF or ACC position.

The auto-unlock feature is cancelled if the doors are locked with the door lock control switch or the Remote Keyless Entry (RKE) transmitter within the 10 minute active window. After the 10-minute active window expires, the auto-unlock feature does not unlock the doors if the driver door is opened.

The Instrument Cluster (IC) sends the vehicle speed signal over the Standard Corporate Protocol (SCP) network to the DDM . If the DDM does not receive the vehicle speed signal or it is invalid, the DDM sets DTC U1041.

**This pinpoint test is intended to diagnose the following:**

- Door ajar switch input
- Vehicle speed signal message from the IC
- DDM

**PINPOINT TEST M: THE AUTO-UNLOCK DOES NOT OPERATE CORRECTLY**

Test Step	Result / Action to Take
<b>M1 VERIFY THE AUTO-UNLOCK FEATURE IS ENABLED</b>	
<ul style="list-style-type: none"> <li>• Verify the auto-unlock feature is enabled. Refer to <u>Autolock and Auto-Unlock Programming</u> in this section.</li> <li>• <b>Is the auto-unlock feature enabled?</b></li> </ul>	<p><b>Yes</b> GO to <u>M2</u> .</p> <p><b>No</b> ENABLE the auto-unlock feature. REFER to <u>Autolock and Auto-Unlock Programming</u> in this section.</p>
<b>M2 CHECK THE COURTESY LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Open and close the doors while observing the courtesy lamp operation.</li> <li>• <b>Do the courtesy lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>M3</u> .</p> <p><b>No</b> REFER to <u>Section 417-02</u> .</p>
<b>M3 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check the recorded results from the DDM self-test.</li> <li>• <b>Is continuous DTC U1041 retrieved?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 413-01</u> to diagnose the speedometer.</p> <p><b>No</b> GO to <u>M4</u> .</p>
<b>M4 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or</p>

sure they seat correctly. • Operate the system and verify the concern is still present. • <b>Is the concern still present?</b>	corroded connector.
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## Pinpoint Test N: The Smart Unlock Does Not Operate Correctly

### Normal Operation

The Lighting Control Module (LCM) sends a network message to the Driver Door Module (DDM) that the key is in the ignition. If the DDM does not receive or receives invalid data for the key-in ignition from the LCM, it sets DTC U1135. The DDM monitors the network message, the door lock control switch and the driver door ajar switch. If the key is in the ignition and the driver door is open when the vehicle is locked with a door lock control switch, the DDM unlocks the driver door. The smart unlocking feature unlocks the LH front door one second after these conditions are met. The vehicle may still be locked with the key in the ignition using the manual lock button, a Remote Keyless Entry (RKE) transmitter, the keyless entry keypad or a key in the driver door lock cylinder.

**This pinpoint test is intended to diagnose the following:**

- Driver door ajar switch
- Key-in-ignition switch
- LCM
- DDM

### PINPOINT TEST N: THE SMART UNLOCK DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
<b>N1 CHECK THE COURTESY LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Open and close the doors while observing the courtesy lamp operation.</li> <li>• <b>Do the courtesy lamps operate correctly?</b></li> </ul>	<b>Yes</b> GO to <u>N2</u> .  <b>No</b> REFER to <u>Section 417-02</u> .
<b>N2 CHECK THE KEY-IN-IGNITION SWITCH OPERATION</b>	
<ul style="list-style-type: none"> <li>• Insert the key in the ignition lock cylinder.</li> <li>• Ignition OFF.</li> <li>• Open the driver door.</li> <li>• <b>Does the chime sound?</b></li> </ul>	<b>Yes</b> GO to <u>N3</u> .  <b>No</b> REFER to <u>Section 413-01</u> to continue diagnosis of the key-in-ignition warning system.
<b>N3 RETRIEVE THE RECORDED DDM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check the recorded results from the DDM self-test.</li> </ul>	<b>Yes</b> GO to <u>N4</u> .  <b>No</b>

<ul style="list-style-type: none"> <li>• Is continuous DTC U1135 retrieved?</li> </ul>	GO to <u>N5</u> .
<b>N4 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>N5 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test O: Hard To Open/Close Door From Either Door Handle****Normal Operation**

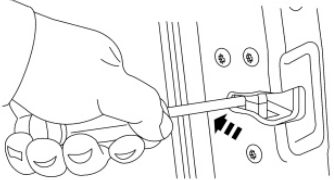
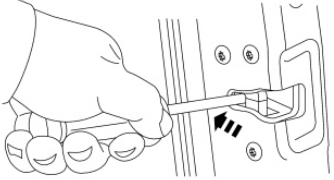
The door latch can be actuated from the interior or exterior door handle. When actuated, the door latch releases and allows the door to open. If the door latch or the door hinges have insufficient lubrication or if the striker or door are misaligned, it causes extra force to be used when opening or closing the door.

**This pinpoint test is intended to diagnose the following:**

- Door alignment
- Door hinges
- Striker adjustment
- Door latch

**PINPOINT TEST O: HARD TO OPEN/CLOSE DOOR FROM EITHER DOOR HANDLE**

Test Step	Result / Action to Take
<b>O1 CHECK THE LATCH OPERATION FROM BOTH DOOR HANDLES</b>	

<ul style="list-style-type: none"> <li>• For the rear doors, make sure the childlock is in the unlock position.</li> <li>• Open and close the door using both the interior and exterior door handles.</li> <li>• <b>Does the door open normally from one of the door handles?</b></li> </ul>	<p><b>Yes</b> If the door is difficult/does not open from the exterior door handle, <u>GO to Pinpoint Test P</u> .</p> <p>If the door is difficult/does not open from the interior door handle, <u>GO to Pinpoint Test Q</u> .</p> <p><b>No</b> If the door does not operate correctly from both door handles, GO to <u>Q2</u> .</p>
<b>O2 CHECK THE LATCH OPERATION</b>	
<ul style="list-style-type: none"> <li>• Open the door.</li> <li>• Using a screwdriver, fully close the latch (2 clicks).</li> </ul>  <p>N0094195</p> <ul style="list-style-type: none"> <li>• Verify that the latch releases easily while pulling on the interior/exterior door handle.</li> <li>• <b>Does the latch release easily?</b></li> </ul>	<p><b>Yes</b> GO to <u>Q4</u> .</p> <p><b>No</b> GO to <u>Q3</u> .</p>
<b>O3 CHECK THE LATCH OPERATION AFTER LUBRICATION</b>	
<ul style="list-style-type: none"> <li>• Lubricate the door latch. Refer to <u>Latch Lubrication</u> in this section.</li> <li>• Using a screwdriver, fully close the latch (2 clicks).</li> </ul>  <p>N0094195</p> <ul style="list-style-type: none"> <li>• Verify that the latch releases easily while pulling on the interior/exterior door handle.</li> <li>• <b>Does the latch release easily?</b></li> </ul>	<p><b>Yes</b> The concern was caused by an insufficiently lubricated door latch.</p> <p><b>No</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> or <u>Rear Door Latch</u> in this section. TEST the system for normal operation.</p>
<b>O4 CHECK THE STRIKER ADJUSTMENT</b>	
	<p><b>Yes</b> GO to <u>Q5</u> .</p>

<ul style="list-style-type: none"> <li>• Check the adjustment of the striker. Refer to <a href="#">Section 501-03</a> .</li> <li>• <b>Is the striker adjusted correctly?</b></li> </ul>	<b>No</b> ADJUST the striker as necessary. TEST the system for normal operation.
<b>O5 CHECK THE DOOR ALIGNMENT</b>	
<ul style="list-style-type: none"> <li>• Check the alignment of the door. Refer to <a href="#">Section 501-03</a> .</li> <li>• <b>Is the door aligned correctly?</b></li> </ul>	<b>Yes</b> LUBRICATE the door hinges. TEST the system for normal operation.  <b>No</b> ADJUST the door as necessary. TEST the system for normal operation.

### Pinpoint Test P: A Door Is Difficult/Does Not Open From The Exterior Door Handle

#### Normal Operation

The exterior door handle is connected to the door latch with an actuating rod. When the exterior door handle is pulled it causes the actuating rod to push down on the latch lever. The actuating rod can be adjusted for correct exterior door handle operation. When the latch lever is moved, the door latch releases, allowing the door to open.

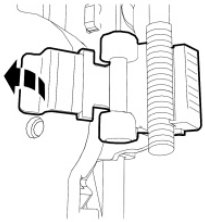
**This pinpoint test is intended to diagnose the following:**

- Broken or binding linkage
- Exterior door handle to latch rod adjustment
- Exterior door handle
- Door latch

#### PINPOINT TEST P: A DOOR IS DIFFICULT/DOES NOT OPEN FROM THE EXTERIOR DOOR HANDLE

Test Step	Result / Action to Take
<b>P1 CHECK THE LATCH OPERATION FROM BOTH DOOR HANDLES</b>	
<ul style="list-style-type: none"> <li>• Open and close the door using both the interior and exterior door handles.</li> <li>• <b>Does the door open normally from one of the door handles?</b></li> </ul>	<b>Yes</b> If the door is difficult/does not open from only the exterior door handle, GO to <a href="#">P2</a> .  <b>No</b> If the door does not operate correctly from both door handles, <a href="#">GO to Pinpoint Test Q</a> .
<b>P2 CHECK THE EXTERIOR DOOR HANDLE</b>	
<ul style="list-style-type: none"> <li>• Remove the door trim panel. Refer to <a href="#">Section 501-05</a> .</li> <li>• Open the clip and disconnect the exterior door handle actuating rod.</li> </ul>	<b>Yes</b> GO to <a href="#">P3</a> .  <b>No</b> INSTALL a new exterior door handle. REFER to <a href="#">Exterior Front Door Handle</a> or <a href="#">Exterior Rear Door Handle</a> in this section. TEST the system for normal operation.



 <p>N0088081</p> <ul style="list-style-type: none"> <li>• Pull and release the exterior door handle.</li> <li>• <b>Does the exterior door handle operate correctly?</b></li> </ul>	
<b>P3 CHECK THE EXTERIOR DOOR HANDLE AND LINKAGE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the exterior door handle while observing the linkage.</li> <li>• <b>Are any of the exterior door handle components or linkages binding or broken?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>P4</u> .</p>
<b>P4 CARRY OUT THE EXTERIOR DOOR HANDLE ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Carry out the exterior door handle to latch rod adjustment. Refer to <u>Door Handle to Latch Rod Adjustment</u> in this section.</li> <li>• <b>Does the exterior door handle operate correctly?</b></li> </ul>	<p><b>Yes</b> The concern was caused by an improperly adjusted exterior door handle.</p> <p><b>No</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> or <u>Rear Door Latch</u> in this section. TEST the system for normal operation.</p>

### Pinpoint Test Q: A Door Is Difficult/Does Not Open From The Interior Door Handle

#### Normal Operation

The interior door handle is connected to the door latch by an actuating linkage. When the interior door handle is pulled it causes the linkage to pull on the latch lever. When the latch lever is moved, the door latch releases, allowing the door to open.

**This pinpoint test is intended to diagnose the following:**

- Broken or binding linkage
- Door latch

#### PINPOINT TEST Q: A DOOR IS DIFFICULT/DOES NOT OPEN FROM THE INTERIOR DOOR HANDLE

Test Step	Result / Action to Take
<b>Q1 CHECK THE LATCH OPERATION FROM BOTH DOOR HANDLES</b>	
<ul style="list-style-type: none"> <li>• For the rear doors, make sure the childlock is in the unlock position.</li> </ul>	<p><b>Yes</b> If the door is difficult/does not open from only the interior door handle, GO to <u>Q2</u> .</p>

#### PINPOINT TEST P: A DOOR IS DIFFICULT/DOES NOT OPEN FROM THE EXTERIOR DOOR HANDLE

<ul style="list-style-type: none"> <li>• Open and close the door using both the interior and exterior door handles.</li> <li>• <b>Does the door open normally from one of the door handles?</b></li> </ul>	<p><b>No</b> If the door does not operate correctly from both door handles, <u>GO to Pinpoint Test Q</u> .</p>
<b>Q2 CHECK THE INTERIOR DOOR HANDLE AND LINKAGE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Remove the door trim panel. Refer to <u>Section 501-05</u> .</li> <li>• Install the interior door handle back onto the linkage.</li> <li>• Operate the interior door handle while observing the linkage.</li> <li>• <b>Are any of the interior door handle components or linkages binding or broken?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> or <u>Rear Door Latch</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test R: Exterior Door Release Handle Sticks****Normal Operation**

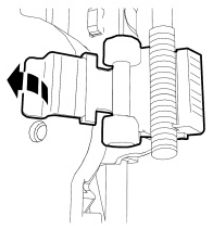
The exterior door handle is connected to the door latch with an actuating rod. When the exterior door handle is pulled it causes the actuating rod to push down on the latch lever. The actuating rod can be adjusted for correct exterior door handle operation. When the latch lever is moved, the door latch releases, allowing the door to open. The handle has a return spring to make sure the handle returns to a closed position.

**This pinpoint test is intended to diagnose the following:**

- Binding linkage
- Broken handle return spring
- Exterior door handle adjustment
- Door latch

**PINPOINT TEST R: EXTERIOR DOOR RELEASE HANDLE STICKS**

Test Step	Result / Action to Take
<b>R1 CHECK FOR A BROKEN RETURN SPRING</b>	
<ul style="list-style-type: none"> <li>• Remove the door trim panel. Refer to <u>Section 501-05</u> .</li> <li>• Open the clip and disconnect the exterior door handle actuating rod.</li> </ul>	<p><b>Yes</b> GO to <u>R2</u> .</p> <p><b>No</b> INSTALL a new exterior door handle. REFER to <u>Exterior Front Door Handle</u> or <u>Exterior Rear Door Handle</u> in this section. TEST the system for normal operation.</p>

 <p>N0088081</p> <ul style="list-style-type: none"> <li>• Pull and release the exterior door handle.</li> <li>• <b>Does the exterior door handle return to a closed position once released?</b></li> </ul>	
<b>R2 CARRY OUT THE EXTERIOR DOOR HANDLE ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Carry out the exterior door handle to latch rod adjustment. Refer to <u>Door Handle to Latch Rod Adjustment</u> in this section.</li> <li>• <b>Does the exterior door handle operate correctly?</b></li> </ul>	<p><b>Yes</b> The concern was caused by an improperly adjusted exterior door handle.</p> <p><b>No</b> GO to <u>R3</u> .</p>
<b>R3 CHECK THE EXTERIOR DOOR HANDLE AND LINKAGE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the exterior door handle while observing the linkage.</li> <li>• <b>Are any of the exterior door handle components or linkages binding?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> or <u>Rear Door Latch</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test S: Interior Door Release Handle Sticks****Normal Operation**

The interior door handle is connected to the door latch by an actuating linkage. When the interior door handle is pulled it causes the linkage to pull on the latch lever. When the latch lever is moved, the door latch releases, allowing the door to open. The handle has a return spring to make sure the handle returns to a closed position.

**This pinpoint test is intended to diagnose the following:**

- Binding linkage
- Broken handle return spring
- Door latch

**PINPOINT TEST S: INTERIOR DOOR RELEASE HANDLE STICKS**

Test Step	Result / Action to Take
<b>S1 CHECK FOR A BROKEN RETURN SPRING</b>	
<ul style="list-style-type: none"> <li>• Remove the interior door handle.</li> </ul>	<p><b>Yes</b> GO to <u>S2</u> .</p>

<ul style="list-style-type: none"> <li>• Pull and release the interior door handle.</li> <li>• <b>Does the interior door handle return to a closed position once released?</b></li> </ul>	<b>No</b> INSTALL a new interior door handle.
<b>S2 CHECK THE INTERIOR DOOR HANDLE LINKAGE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Remove the door trim panel. Refer to <a href="#">Section 501-05</a> .</li> <li>• Observe the door latch release linkage for any damage or binding.</li> <li>• <b>Is the door latch release linkage OK?</b></li> </ul>	<b>Yes</b> INSTALL a new door latch. REFER to <a href="#">Front Door Latch</a> or <a href="#">Rear Door Latch</a> in this section. TEST the system for normal operation.  <b>No</b> REPAIR as necessary. TEST the system for normal operation.

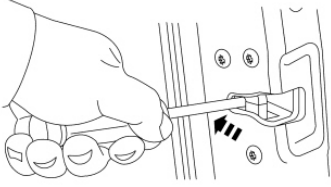
**Pinpoint Test T: Squeak/Rattle/Chucking Noise From Door**

This pinpoint test is intended to diagnose the following:

- Door alignment
- Striker adjustment
- Door latch

**PINPOINT TEST T: SQUEAK/RATTLE/CHUCKING NOISE FROM DOOR**

Test Step	Result / Action to Take
<b>T1 CHECK FOR ANY LOOSE COMPONENTS</b>	
<ul style="list-style-type: none"> <li>• Remove the door trim panel. Refer to <a href="#">Section 501-05</a> .</li> <li>• Inspect inside the door for any loose components.</li> <li>• <b>Are there any loose components inside the door?</b></li> </ul>	<b>Yes</b> REPAIR as necessary. TEST the system for normal operation.  <b>No</b> GO to <a href="#">T2</a> .
<b>T2 CHECK THE STRIKER ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Check the adjustment of the striker. Refer to <a href="#">Section 501-03</a> .</li> <li>• <b>Is the striker adjusted correctly?</b></li> </ul>	<b>Yes</b> GO to <a href="#">T3</a> .  <b>No</b> ADJUST the striker as necessary. TEST the system for normal operation.
<b>T3 CHECK THE DOOR ALIGNMENT</b>	
<ul style="list-style-type: none"> <li>• Check the alignment of the door. Refer to <a href="#">Section 501-03</a> .</li> <li>• <b>Is the door aligned correctly?</b></li> </ul>	<b>Yes</b> GO to <a href="#">T4</a> .  <b>No</b> ADJUST the door as necessary. TEST the system for

	normal operation.
<b>T4 CHECK THE LATCH OPERATION AFTER LUBRICATION</b>	
<ul style="list-style-type: none"> <li>• Lubricate the door latch. Refer to <u>Latch Lubrication</u> in this section.</li> <li>• Using a screwdriver, fully close the latch (2 clicks).</li> </ul>  <p>N0094195</p> <ul style="list-style-type: none"> <li>• Operate the door latch and listen for the noise.</li> <li>• <b>Is the original noise still present after the latch is lubricated?</b></li> </ul>	<p><b>Yes</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> or <u>Rear Door Latch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The concern was caused by an insufficiently lubricated door latch.</p>

### Pinpoint Test U: Manual Door Lock Cylinder Inoperative

#### Normal Operation

The door lock cylinder is connected to the door latch via a lock rod and can be used to manually lock/unlock a door.

**This pinpoint test is intended to diagnose the following:**

- Bent or binding lock rod and lever
- Door lock cylinder
- Door latch

#### PINPOINT TEST U: MANUAL DOOR LOCK CYLINDER INOPERATIVE

Test Step	Result / Action to Take
<b>U1 CHECK THE LOCK CYLINDER OPERATION AFTER LUBRICATION</b>	
<ul style="list-style-type: none"> <li>• Spray a lock lubricant such as Motorcraft XL-1 into the lock cylinder opening for a couple seconds.</li> <li>• Operate the door lock cylinder with the key.</li> <li>• <b>Does the door lock and unlock using the door lock</b></li> </ul>	<p><b>Yes</b> The concern was caused by an insufficiently lubricated lock cylinder. Spray a multi-purpose grease such as Motorcraft XL-5 into the lock cylinder for a couple seconds to provide long term lubrication.</p> <p><b>No</b> GO to <u>U2</u> .</p>

<b>cylinder?</b>	
<b>U2 CHECK THE DOOR LOCK CYLINDER</b>	
<ul style="list-style-type: none"> <li>• Remove the door lock cylinder. Refer to <u>Door Lock Cylinder</u> in this section.</li> <li>• Operate the door lock cylinder with the key.</li> <li>• <b>Does the door lock cylinder rotate freely to both lock and unlock positions?</b></li> </ul>	<p><b>Yes</b> GO to <u>U3</u> .</p> <p><b>No</b> INSTALL a new door lock cylinder. REFER to <u>Door Lock Cylinder</u> in this section. TEST the system for normal operation.</p>
<b>U3 CHECK THE DOOR LOCK CYLINDER LINKAGE</b>	
<ul style="list-style-type: none"> <li>• Operate the door lock cylinder while observing the linkage.</li> <li>• <b>Is the door lock cylinder rod and lever bent or binding?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new door latch. REFER to <u>Front Door Latch</u> in this section. TEST the system for normal operation.</p>

## **Keyless Entry Keypad Code Programming**

### **Programming A Personal Keyless Entry Keypad Code**

**NOTE:** Up to 3 personal keyless entry keypad codes can be programmed.

1. Enter the factory set keyless entry keypad code.
2. Within 5 seconds, press the 1/2 button on the keypad.
3. Enter the personal 5-digit keyless entry keypad code. Each number must be pressed within 5 seconds of each other.
4. To store each new personal code, press the 1/2 button within 5 seconds of entering the fifth digit of the new code to store the first code, for the second code press the 3/4 button, or for the third code press the 5/6, 7/8, or 9/0. The doors lock then unlock, confirming the new code is programmed.
5. The door locks lock and unlock, confirming the new code is programmed.

### **Erasing the Personal Keyless Entry Keypad Codes**

1. Enter the factory set keyless entry keypad code.
  2. Within 5 seconds, press and release the 1/2 button.
  3. Within 5 seconds, press and hold the 1/2 button for 2 seconds.
  4. The personal codes are now erased and only the factory set code will work.
-

### **Remote Keyless Entry (RKE) Transmitter Programming**

**NOTE:** Programming must be done at the same time for all the Remote Keyless Entry (RKE) transmitters.

**NOTE:** Programming of the RKE transmitters can be accomplished using a scan tool or by carrying out the following steps:

1. Turn the key from OFF to RUN 8 times within 10 seconds, ending in RUN. The doors lock then unlock, confirming program mode has been entered.
  2. Press any button on each RKE transmitter to be programmed. The doors lock and unlock to confirm that each RKE transmitter has been programmed.
  3. If additional RKE transmitters are to be programmed, repeat Step 2 within 7 seconds. If more than 7 seconds have elapsed, the entire procedure must be repeated.
  4. To exit program mode, wait at least 7 seconds or turn the ignition key to the OFF position.
  5. Wait at least 20 seconds after turning the key to the OFF position, or after the last RKE transmitter is programmed, to activate an RKE transmitter for testing and verification.
-



## **Autolock and Auto-Unlock Programming**

### **Autolock**

**NOTE:** This procedure must be completed within 30 seconds.

1. Close all the doors.
2. Turn the key to the OFF position.
3. Turn the key to the RUN position.
4. Press the UNLOCK button 3 times.
5. Turn the key to the OFF position.
6. Press the UNLOCK button 3 times.
7. Turn the key to the RUN position. The doors lock and unlock to confirm entry into program mode.
8. Press the UNLOCK then the LOCK button once to toggle the autolock feature on or off. The horn chirps once if autolock was deactivated or a chirp followed by a honk if autolock was activated.
9. Exit program mode by turning the key to the OFF position.
10. Drive the vehicle to confirm autolock status.

### **Auto-Unlock**

**NOTE:** This procedure must be completed within 30 seconds.

1. Close all the doors.
2. Turn the key to the OFF position.
3. Turn the key to the RUN position.
4. Press the UNLOCK button 3 times.
5. Turn the key the OFF position.
6. Press the UNLOCK button 3 times.
7. Turn the key to the RUN position. The doors lock and unlock to confirm entry into program mode.
8. Press the LOCK then the UNLOCK button once to toggle the auto-unlock feature on or off. The horn chirps once if auto-unlock was deactivated or a chirp followed by a honk if auto-unlock was activated.
9. Exit program mode by turning the key to the OFF position.

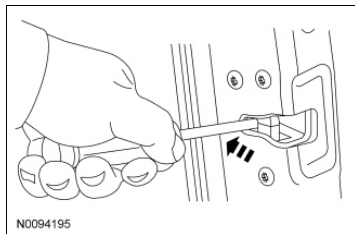
10. Drive the vehicle to confirm auto-unlock status.
-

**Latch Lubrication**

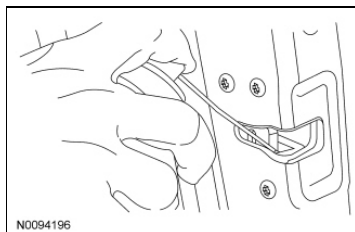
## Material

Item	Specification
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

1. Open the door.
2. Using a screwdriver, fully close the latch (2 clicks).



3. Spray the multi-purpose grease into the opening on the door latch for approximately 5 seconds.



4. Open the latch using either the interior or exterior door handle.
  5. Open and close the door several times to circulate the lubricant inside the latch.
  6. Wipe off any excess grease.
-



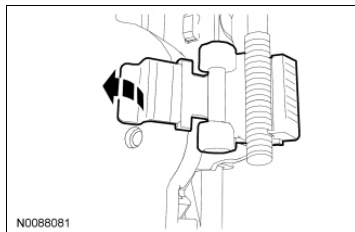
### Door Handle to Latch Rod Adjustment

**NOTE:** If the vehicle is equipped with an adjustable door latch actuating rod, perform this procedure.

**NOTE:** An incorrectly adjusted exterior door handle can cause a loose handle, rattle noise, door hard to open from the outside door handle, or the outside door handle to not sit flush in the closed position.

**NOTE:** Prior to carrying out the adjustment procedure, the door latch, exterior door handle, and linkages must be installed on the door.

1. Raise the door glass to the full-up position.
2. Remove the door trim panel. For additional information, refer to [Section 501-05](#).
3. Position the water shield aside.
4. Open the clip and disconnect the exterior door handle actuating rod.

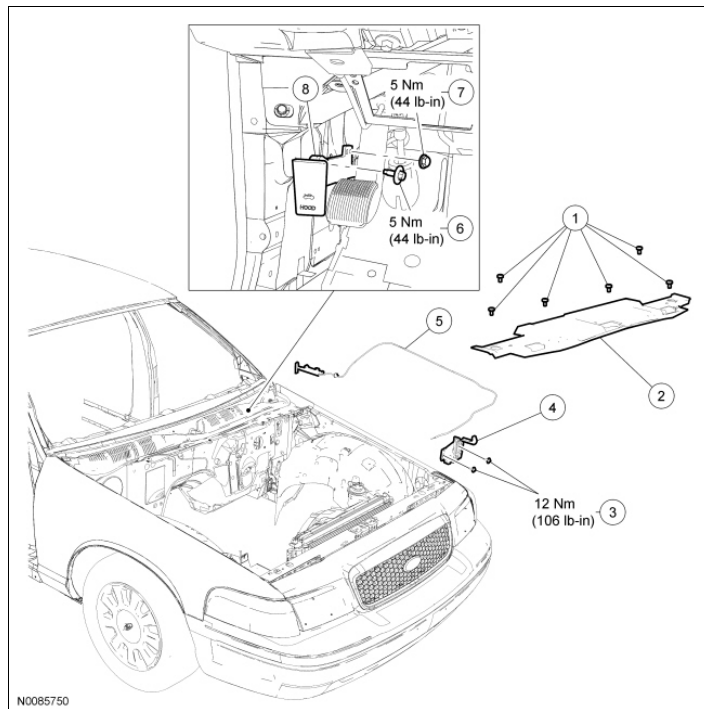


5. Position the actuating rod and latch actuating lever in a neutral position.
6. **NOTE:** Do not push up or pull down on the actuating rod or latch actuating lever.

Reinstall the exterior door handle actuating rod back into the clip.

7. Close the clip and test the system to make sure that the exterior door handle is operating correctly.
  8. Reseal the water shield.
  9. Install the door trim panel. For additional information, refer to [Section 501-05](#).
-



**Hood Latch and Components - Exploded View**

Item	Part Number	Description
1	W706519	Pin-type retainers (6 required)
2	8C291	Radiator sight shield
3	N606677	Hood latch bolts (2 required)
4	16700	Hood latch
5	-	Hood latch release cable and handle (part of 16916)
6	W611104	Hood latch release cable handle bolt
7	N620480	Hood latch release cable handle nut
8	16916	Hood latch release handle

1. For additional information, refer to the procedures in this section.





## Hood Latch

### Removal and Installation

1. Remove the 6 pin-type retainers and the radiator sight shield.
2. **NOTE:** Mark the position of the hood latch prior to removal of the bolts.

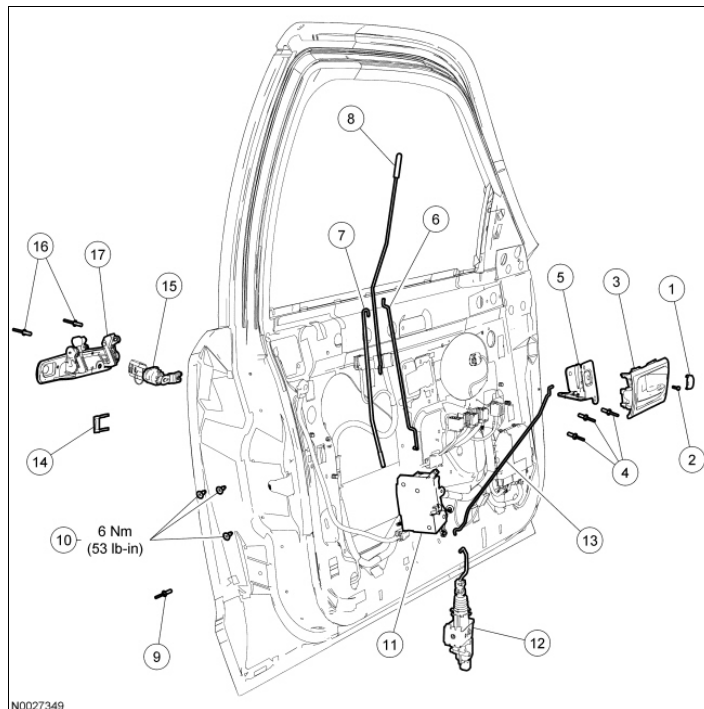
Remove the 2 hood latch bolts.

- To install, tighten to 12 Nm (106 lb-in).
3. Disconnect the cable and remove the hood latch.
  4. To install, reverse the removal procedure.
    - Check the hood latch adjustment to make sure the hood striker engages the hood latch correctly.
-

## **Hood Latch Release Handle**

### **Removal and Installation**

1. Remove the LH fender splash shield. For additional information, refer to Section 501-02 .
  2. Remove the hood latch. For additional information, refer to Hood Latch in this section.
  3. Release the hood latch release cable locators.
  4. Remove the bolt, the nut and the hood latch release handle and cable.
    - To install, tighten to 5 Nm (44 lb-in).
  5. To install, reverse the removal procedure.
-


**Front Door Handles, Locks and Latches - Exploded View**

Item	Part Number	Description
1	5422642	Interior door handle cup cover
2	W505584	Interior door handle screw
3	5421818/ 5421819	Interior door handle (RH/LH)
4	W525172	Interior door handle remote control rivets (3 required)
5	54219A64/ 54219A65	Interior door handle remote control (RH/LH)
6	5422152/ 5422153	Door lock cylinder actuating rod (RH/LH)
7	5422134/ 5422135	Exterior door handle actuating rod (RH/LH)
8	5421850/ 5421851	Door lock push button rod (RH/LH)
9	W712650	Door lock actuator rivet
10	W710772-S900	Front door latch screws (3 required)
11	5421812/ 5421813	Front door latch (RH/LH)
12	54218A42	Door lock actuator
13	5421940/ 5421941	Interior door handle remote control actuating rod (RH/LH)
14	5422023	Door lock cylinder clip
15	5421990/ 5421991	Door lock cylinder (RH/LH)
16	W712650	Exterior door handle rivets (2 required)
17	5422404/ 5422405	Exterior door handle (RH/LH)

1. For additional information, refer to the procedures in this section.
-

## Front Door Latch

### Special Tool(s)

	<p>Heavy Duty Riveter 501-D011 (D80L-23200-A)</p>
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### Removal and Installation

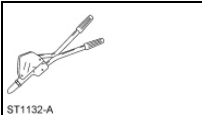
1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#) .
2. Position the watershield aside.
3. Remove the 3 rivets and position the interior door handle remote control aside.
4. Open the clip and release the exterior door handle actuating rod.
5. If equipped, disconnect the door lock cylinder actuating rod from the door lock cylinder.
6. Disconnect the door ajar switch electrical connectors.
7. Disconnect the door lock actuator electrical connector.
8. Remove the door lock actuator rivet.
9. Remove the 3 screws and the front door latch.
  - To install, tighten to 6 Nm (53 lb-in).
10. To install, reverse the removal procedure.
  - Use the special tool to install the new rivets.



---

## Front Door Lock Actuator

### Special Tool(s)

	Heavy Duty Riveter 501-D011 (D80L-23200-A)
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### Removal and Installation

1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#) .
  2. Position the watershield aside.
  3. Disconnect the door lock actuator electrical connector.
  4. Remove the door lock actuator rivet.
  5. Remove the door lock actuator.
  6. To install, reverse the removal procedure.
    - Use the special tool to install the new rivets.
-

## **Door Ajar Switch - Front**


### **Removal and Installation**

1. Remove the front door trim panel. For additional information, refer to Section 501-05 .
  2. Disconnect the 2 electrical connectors.
  3. Remove the screw and the door ajar switch.
  4. To install, reverse the removal procedure.
-



## Exterior Front Door Handle

### Special Tool(s)

	Heavy Duty Riveter 501-D011 (D80L-23200-A)
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### Removal and Installation

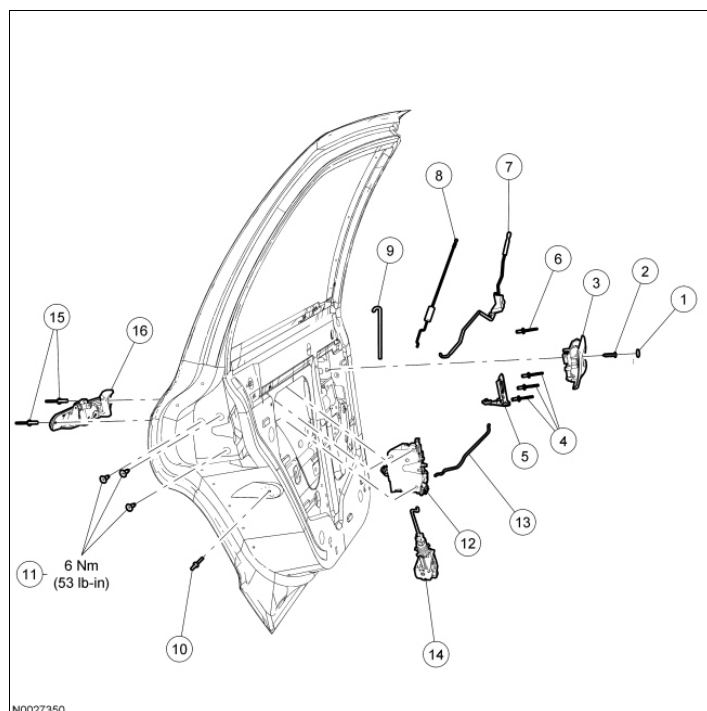
1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#) .
  2. Position the watershield aside.
  3. Open the clip and release the exterior door handle actuating rod.
  4. Remove the 2 rivets and the exterior door handle.
  5. To install, reverse the removal procedure.
    - Use the special tool to install the new rivets.
-

## Door Lock Cylinder

### Removal and Installation

**NOTE:** Individual lock cylinders are repaired by discarding the inoperative lock cylinder and building a new lock cylinder using the appropriate lock repair package. The lock repair package includes a detailed instruction sheet to build the new lock cylinder to the current key code of the vehicle.

1. Remove the exterior front door handle. For additional information, refer to Exterior Front Door Handle in this section.
  2. Disconnect door lock cylinder actuating rod.
  3. If equipped, disconnect the door disarm switch electrical connector.
  4. Remove the clip and the door lock cylinder.
  5. To install, reverse the removal procedure.
-

**Rear Door Handles, Locks and Latches - Exploded View**


Item	Part Number	Description
1	5422642/ 5422643	Interior door handle screw cover
2	W505584	Interior door handle screw
3	5422634/ 5422635	Interior door handle (RH/LH)
4	W525172	Interior door handle remote control rivets (3 required)
5	54264B52/ 54264B53	Interior door handle remote control (RH/LH)
6	W705528	Lock rod bellcrank rivet
7	54264B14/ 54264B15	Lock rod and bellcrank (RH/LH)
8	5421850/ 5421851	Push button rod (police only) (RH/LH)
9	5426596	Exterior door handle actuating rod
10	W712650	Door lock actuator rivet
11	W710772-S900	Rear door latch screws (3 required)
12	5426412/ 5426413	Rear door latch (RH/LH)
13	5426442/ 5426443	Interior door handle actuating rod (RH/LH)
14	5426594	Door lock actuator
15	W707874	Exterior door handle rivets (2 required)
16	5426604/ 5426605	Exterior door handle (RH/LH)

1. For additional information, refer to the procedures in this section.



**Rear Door Latch**

## Special Tool(s)

	Heavy Duty Riveter 501-D011 (D806-23200-A)
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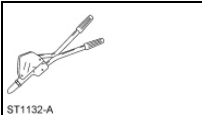
**Removal and Installation**

1. Remove the rear door trim panel. For additional information, refer to Section 501-05 .
  2. Position the watershield aside.
  3. Remove the 3 rivets and position the interior door handle remote control aside.
  4. If equipped with the police package, remove the door lock push button rod cover.
  5. Remove the door lock push button rod bellcrank rivet.
  6. Disconnect the door lock push button rod from the lock rod bellcrank.
  7. Release the door lock push button rod from the clip.
  8. Open the clip and release the exterior door handle actuating rod.
  9. Disconnect the door ajar switch electrical connectors.
  10. Disconnect the door lock actuator electrical connector.
  11. Remove the door lock actuator rivet.
  12. Remove the 3 screws and remove the rear door latch.
    - To install, tighten to 6 Nm (53 lb-in).
  13. To install, reverse the removal procedure.
    - Use the special tool to install the new rivets.
-



## Rear Door Lock Actuator

### Special Tool(s)

	Heavy Duty Riveter 501-D011 (D80L-23200-A)
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### Removal and Installation

1. Remove the rear door latch. For additional information, refer to Rear Door Latch in this section.
  2. Remove the door lock actuator.
  3. To install, reverse the removal procedure.
    - Use the special tool to install the new rivets.
-

## **Door Ajar Switch - Rear Door**


### **Removal and Installation**

1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#) .
  2. Disconnect the 2 electrical connectors.
  3. Remove the screw and the door ajar switch.
  4. To install, reverse the removal procedure.
-



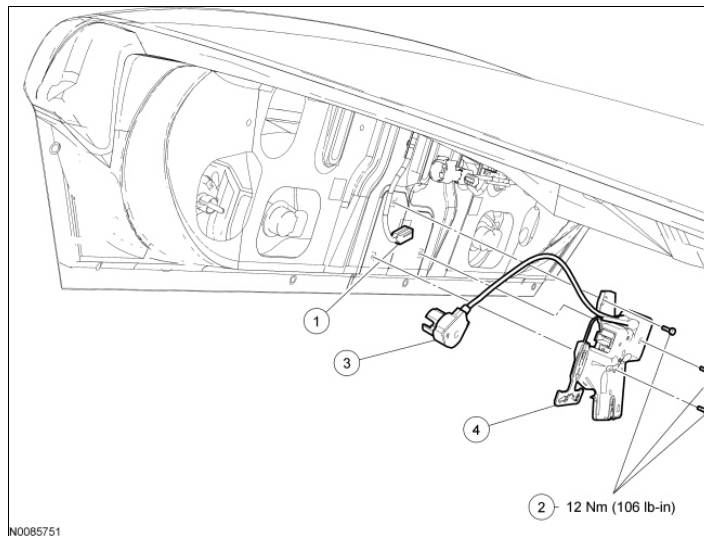
## Exterior Rear Door Handle

### Special Tool(s)

	Heavy Duty Riveter 501-D011 (D80L-23200-A)
---	---

### Removal and Installation

1. Remove the rear door trim panel. For additional information, refer to [Section 501-05](#) .
  2. Position the watershield aside.
  3. Open the clip and release the exterior door handle actuating rod.
  4. Remove the 2 rivets and remove the exterior door handle.
  5. To install, reverse the removal procedure.
    - Use the special tool to install the new rivets.
-

**Luggage Compartment Lid Latch**

Item	Part Number	Description
1	-	Luggage compartment lid latch electrical connector (part of 14A227)
2	W712308	Luggage compartment lid latch bolts (3 required)
3	-	Luggage compartment lid lock cylinder cable (part of 5443200)
4	5443200	Luggage compartment lid latch


**Removal and Installation**

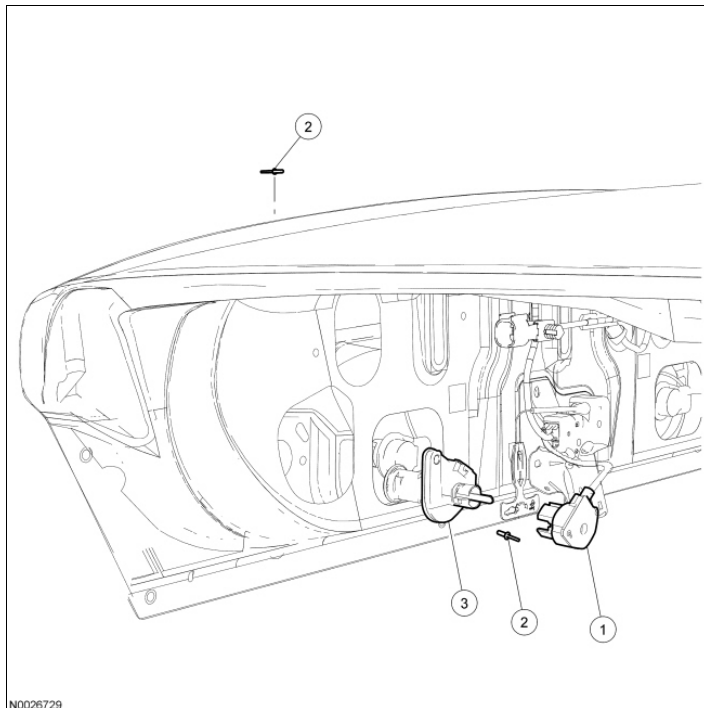
1. Disconnect the luggage compartment lid latch electrical connector.
2. Disconnect the luggage compartment lid lock cylinder cable from the lock cylinder.
3. Remove the bolts and the luggage compartment lid latch.
  - To install, tighten to 12 Nm (106 lb-in).
4. To install, reverse the removal procedure.



**Luggage Compartment Lid Lock Cylinder**

## Special Tool(s)

 ST1132-A	Heavy Duty Riveter 501-D011 (D80L-23200-A)
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N0026729

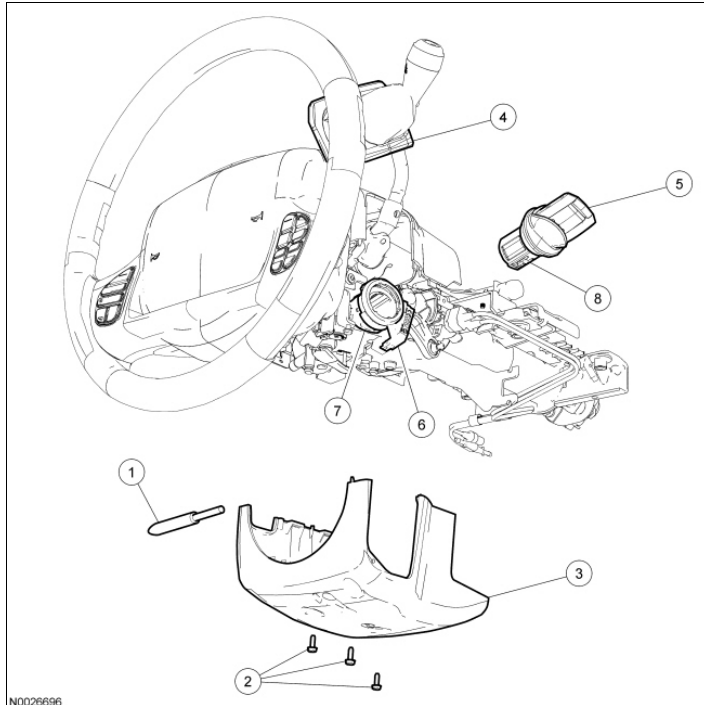
Item	Part Number	Description
1	-	Luggage compartment lid lock cylinder cable (part of 5443200)
2	N602701	Luggage compartment lid lock cylinder rivets (2 required)
3	5443262	Luggage compartment lid lock cylinder

**Removal and Installation**

**NOTE:** Individual lock cylinders are repaired by discarding the inoperative lock cylinder and building a new lock cylinder using the appropriate lock repair package. The lock repair package includes a detailed instruction sheet to build the new lock cylinder to the current key code of the vehicle.

1. Remove the license plate housing. For additional information, refer to [Section 501-08](#).
2. Release the clips and disconnect the luggage compartment lid lock cylinder cable.
3. If equipped, disconnect the luggage compartment anti-theft inhibit switch electrical connector.

4. Remove the 2 luggage compartment lid lock cylinder rivets.
  5. Remove the luggage compartment lid lock cylinder.
  6. To install, reverse the removal procedure.
    - Use the special tool to install the new rivets.
-

**Ignition Lock Cylinder - Functional**

Item	Part Number	Description
1	3F609	Tilt wheel handle and shank
2	55929	Lower steering column shroud screws (3 required)
3	3530	Lower steering column shroud
4	3530	Selector lever boot (if equipped)
5	-	Ignition key
6	15607	Passive Anti-Theft System (PATS) transceiver
7	-	Ignition lock cylinder release pin (part of 11582)
8	11582	Ignition lock cylinder

**Removal**

1. Remove the steering column shroud. For additional Information, refer to [Section 211-04](#) .
2. If equipped, position the selector lever boot aside.
3. Insert the ignition key and position the ignition lock cylinder to the RUN position.
4. Release the 2 Passive Anti-Theft System (PATS) transceiver tabs and rotate the PATS transceiver In order to access to the ignition lock cylinder release pin hole.
5. Using a suitable tool, depress the ignition lock cylinder release pin through the access hole while pulling the ignition lock cylinder outward.

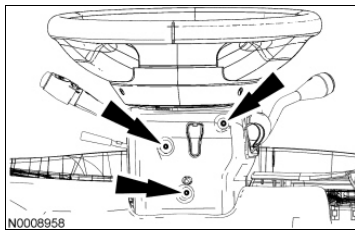
**Installation**

1. Make sure the ignition lock cylinder is in the RUN position.
  2. Insert the ignition lock cylinder into the ignition lock cylinder access hole located on the steering column.
    - Make sure to align the locking pin with the locking pin access hole.
  3. Rotate the Passive Anti-Theft System (PATS) transceiver and attach the 2 retaining tabs onto the steering column.
  4. Install the steering column shroud. For additional Information, refer to Section 211-04 .
  5. Rotate the ignition key through all lock cylinder positions to check for correct operation.
-

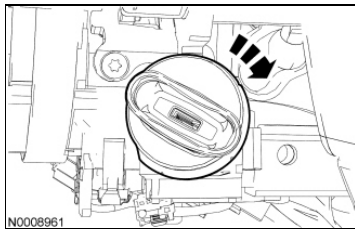
## Ignition Lock Cylinder - Non Functional

### Removal and Installation

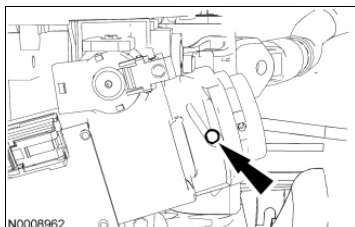
1. Disconnect the battery. For additional information, refer to [Section 414-01](#) .
2. Remove the steering wheel. For additional information, refer to [Section 211-04](#) .
3. Remove the tilt wheel handle and shank.
4. Remove the 3 screws and the lower steering column shroud.



5. If equipped, position the shift selector boot aside.
6. Twist off the cap from the ignition lock cylinder.

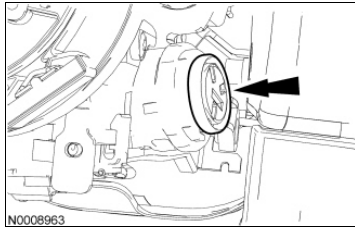


7. Release the tabs and slide the Passive Anti-Theft System (PATS) transceiver off the steering column.
8. Disconnect the electrical connector and remove the PATS transceiver.
9. Use a 1/8-inch diameter drill bit to drill out the lock cylinder retaining pin.



10. Use a 3/8-inch diameter drill to drill down the middle of the ignition lock cylinder key slot until the ignition lock cylinder breaks loose.



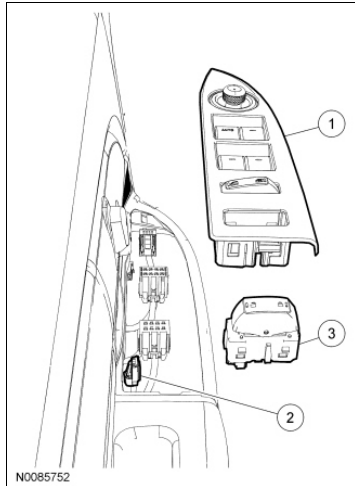


11. Remove and discard the ignition lock cylinder and drill shavings from the steering column.
    - Thoroughly clean all drill shavings from the steering column and inspect it for damage.
  12. To install, reverse the removal procedure.
-

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**Door Lock Control Switch**

**NOTE:** Driver side shown, passenger side similar.

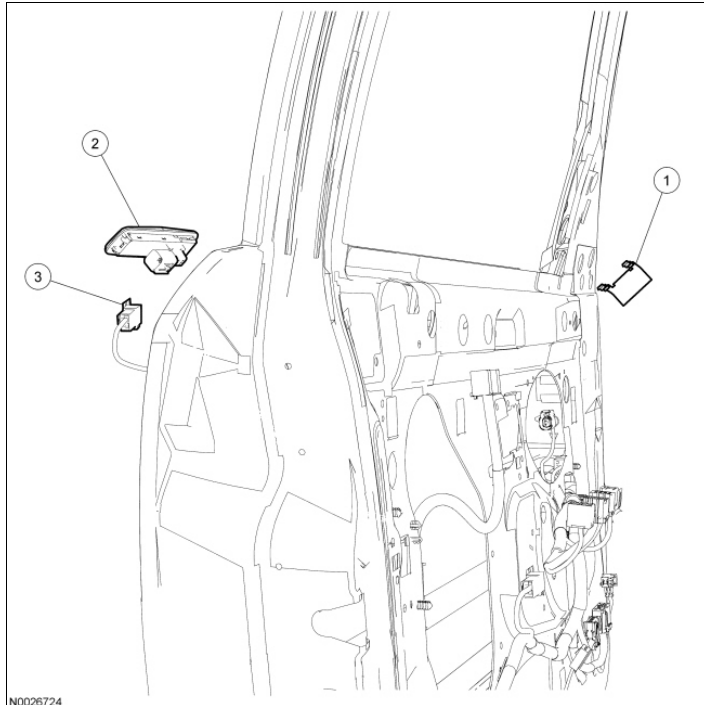


Item	Part Number	Description
1	14527/14528	Door switch plate (LH/RH)
2	-	Door lock switch electrical connector (part of 14A005)
3	14028	Door lock control switch

**Removal and Installation**

1. Lift up on the front of the switch plate to unclip it from the front door trim panel and position it aside.
  2. Disconnect the electrical connectors.
  3. Release the clips and remove the door lock control switch.
  4. To install, reverse the removal procedure.
-



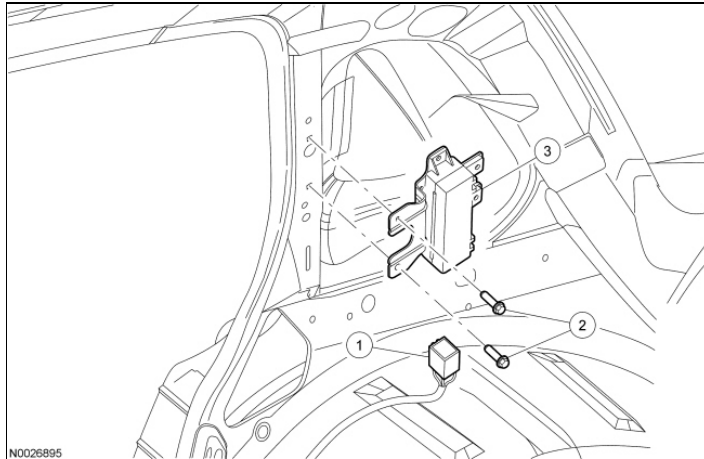
**Keyless Entry Keypad**

Item	Part Number	Description
1	14A667	Keyless entry keypad clip
2	14A626	Keyless entry keypad
3	-	Keyless entry keypad electrical connector (part of 14A005)

**Removal and Installation**

1. Remove the LH front door trim panel. For additional information, refer to [Section 501-05](#).
2. Position the watershield aside.
3. Remove the clip and the keyless entry keypad.
  - Disconnect the electrical connector.
4. To install, reverse the removal procedure.



**Antenna**

Item	Part Number	Description
1	-	Antenna electrical connector (part of 14A005)
2	N807122	Antenna screws (2 required)
3	15K602	Antenna

**Removal and Installation**

1. Remove the RH rear quarter trim panel. For additional information, refer to [Section 501-05](#).
2. Disconnect the antenna electrical connector.
3. Remove the 2 screws and the antenna.
4. To install, reverse the removal procedure.



## Material

Item	Specification	Fill Capacity
Motorcraft® Premium Quality Windshield Washer Fluid (Canada) CXC-37-(A, B, D, and F) (Canada)	-	-
Motorcraft® Premium Windshield Washer Concentrate (US) ZC-32-A or B (US)	WSB-M8B16-A2	-

## General Specifications

Item	Specification
LH wiper pivot arm installation position	58 mm (2.28 in)
RH wiper pivot arm installation position	60 mm (2.36 in)

## Torque Specifications

Description	Nm	lb-in
Evaporative emission canister purge valve nuts	6	53
Windshield washer pump and reservoir bolts	6	53
Windshield wiper motor bolts	13	115
Wiper mounting arm and pivot shaft bolts	12	106





## Wipers and Washers

The windshield wiper/washer system consists of the following components:

- Windshield wiper blades
- Windshield wiper pivot arm
- Windshield wiper mounting arm and pivot shaft assembly
- Windshield wiper motor
- Windshield washer nozzle
- Windshield washer reservoir
- Windshield washer pump

The wiper system is activated by the multifunction switch. The multifunction switch provides input to the front wiper motor module to activate wash, low, high and intermittent modes.




The washer system consists of the washer reservoir and washer pump. When the multifunction switch is placed into the wash mode, the windshield wiper motor integral electronics activate the washer pump to direct washer fluid to the windshield.

If equipped with automatic headlamps, the Lighting Control Module (LCM) will illuminate the exterior lamps, including the parking lamps, when the front wipers are on for more than 10 seconds and the headlamp control is in the AUTOLAMP position. When the wipers are turned off, the exterior lamps will remain on for 30 seconds before turning off.

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**Wipers and Washers****Special Tool(s)**

 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation**

The windshield wiper motor receives inputs from the following:

- Multifunction switch
- Lighting Control Module (LCM)
- Ignition switch
- Battery Junction Box (BJB)
- Central Junction Box (CJB)

The following components are integrated into the windshield wiper motor:

- Windshield wiper motor module
- High/low speed relay
- Run/park sensor (Hall effect)
- Washer pump relay

If equipped with automatic headlamps, the LCM will illuminate the exterior lamps, including the parking lamps, when the front wipers are on for more than 10 seconds.

**High-Speed Operation**

When the multifunction switch is set to the high-speed position, it supplies ground to the integral high/low speed relay coil and the integral run/park relay coil, which causes the windshield wiper motor to operate at high speed. During high-speed operation only, both the integral high/low-speed relay coil ground and the integral run/park relay coil ground are controlled directly by the multifunction switch. This differs from low speed or intermittent operation when the integral run/park relay coil is controlled by the microprocessor. When the switch is placed in the OFF position, the motor continues to operate until the motor returns to the PARK position and the internal Hall-effect sensor senses the motor magnet. The output to the integral run/park relay deactivates the relay and disconnects the voltage to the motor.

Since the integral high/low relay coil and the integral run/park relay coil are both controlled by a hardwired circuit to the multifunction switch, the windshield wipers will still operate in high speed mode if the internal

windshield wiper module fails, but will not automatically park when the multifunction switch is turned to the OFF position.

### Low-Speed

When the multifunction switch is set to the low-speed position, it supplies ground to the internal windshield wiper motor module low-speed inputs and the windshield wiper motor operates at low speed. During low-speed operation, the integral run/park relay is activated by the microprocessor and supplies 12 volts to the low-speed brush of the windshield wiper motor. The integral run/park relay coil ground is controlled by the internal windshield wiper motor module based on inputs received from the multifunction switch. When the switch is placed in the OFF position, the motor continues to operate until the motor returns to the PARK position and the internal Hall-effect sensor senses the motor magnet. The output to the integral run/park relay deactivates the relay and disconnects the voltage to the motor.

### Intermittent Speed

When the multifunction switch is set to the intermittent position(s), it supplies ground to the windshield wiper motor module inputs and the windshield wiper motor operates in intermittent mode. During intermittent operation, the windshield wiper motor activates the integral run/park relay coil which sends voltage through the integral high/low relay. The integral high/low relay remains deactivated, supplying the voltage to the low-speed brush of the windshield wiper motor. The windshield motor continues to operate until the internal Hall-effect sensor senses the magnet (PARK position) and deactivates the integral run/park relay, which disconnects voltage from the wiper motor. The windshield wipers remain parked until the windshield wiper motor module completes a time-out and then repeats the intermittent windshield wiper cycle.

### Washer System

The windshield washer system consists of the washer reservoir and washer pump. When WASH is selected on the multifunction switch, the windshield wiper motor module activates its integral washer relay which sends voltage to the washer pump to direct fluid to the windshield.

### Software Safe Mode

The windshield wiper motor defaults to software safe mode when the run/park sensor does not sense the Hall-effect magnet inside the wiper motor. This can be caused by an obstruction of the windshield wipers, a binding linkage or loss of the Hall sensor signal. The motor continues to operate in a high/low-speed condition, and when turned off, the wipers immediately park on the windshield. If necessary, the wipers can be turned on and off until they return to the PARK position.

**Windshield Wiper Circuit Function Table**

<b>Multifunction Switch Position</b>	<b>Circuit 680 (LB/OG)</b>	<b>Circuit 61 (YE/RD)</b>	<b>Circuit 56 (DB/OG)</b>	<b>Circuit 58 (WH)</b>	<b>Circuit 63 (RD)</b>
OFF	OPEN	OPEN	OPEN	OPEN	OPEN
INT 1	OPEN	OPEN	OPEN	OPEN	GROUND
INT 2	OPEN	OPEN	OPEN	GROUND	GROUND
INT 3	OPEN	OPEN	OPEN	GROUND	OPEN
INT 4	OPEN	OPEN	GROUND	GROUND	OPEN
INT 5	OPEN	OPEN	GROUND	OPEN	OPEN
LOW	OPEN	OPEN	GROUND	OPEN	GROUND

HIGH	OPEN	GROUND	GROUND	OPEN	GROUND
WASH	GROUND	OPEN/GROUND	OPEN/GROUND	OPEN/GROUND	OPEN/GROUND

### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect the following for obvious signs of mechanical or electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Windshield washer hoses</li> <li>• Wiper linkage</li> <li>• Multifunction switch</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 110 (30A)</li> <li>• Central Junction Box (CJB) fuse 7 (10A)</li> <li>• Circuitry</li> <li>• Windshield wiper motor</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** The windshield wiper motor does not communicate on the network. The windshield wiper motor provides wiper on/off status directly to the Lighting Control Module (LCM).

**NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
  - check the scan tool connection to the VCM .
  - refer to **Section 418-00** , No Power To The Scan Tool, to diagnose no power to the scan tool.
6. If the scan tool does not communicate with the vehicle:
    - verify the ignition key is in the ON position.
    - verify the scan tool operation with a known good vehicle.
    - refer to **Section 418-00** to diagnose no response from the LCM .
  7. Carry out the network test.

- If the scan tool responds with no communication from one or more modules, refer to [Section 418-00](#).
- If the network test passes, retrieve and record the Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM.

9. If the DTCs retrieved are related to the concern, to the Lighting Control Module (LCM) DTC Chart. For all other DTCs, refer to [Section 419-10](#).

10. If not DTCs related to the concern are retrieved, GO to [Symptom Chart](#).

### Lighting Control Module (LCM) DTC Chart

DTC	Description	Action
B1449	Wiper Park Sense Circuit Short to Ground	DISCONNECT LCM C2145D and windshield wiper motor C125. CHECK circuit 28 (BK/PK) for a short to ground. MEASURE the resistance between LCM C2145D-14, circuit 28 (BK/PK), harness side and ground. REPAIR the short to ground as needed. If circuit is OK, INSTALL a new LCM. CLEAR the DTC. CARRY OUT the self-test.
All other DTCs	-	REFER to the Master DTC Chart in <a href="#">Section 419-10</a> .

### Symptom Chart

Symptom Chart

### Pinpoint Tests

#### Pinpoint Test A: The Wipers are Inoperative

Refer to Wiring Diagrams Cell [81](#), Wipers and Washers for schematic and connector information.

#### Normal Operation

The windshield wiper motor receives battery voltage from the Battery Junction Box (BJB) through circuit 2025 (RD/YE), and voltage from the Central Junction Box (CJB) through circuit 65 (DG) when the ignition switch is in the RUN or ACC position. The windshield wiper motor is grounded through circuit 676 (PK/OG) and circuit 57 (BK). The windshield wiper motor receives open and ground inputs from the multifunction switch through circuits 56 (DB/OG), 58 (WH), 61 (YE/RD) and 63 (RD). When a wiper function is selected, the multifunction switch grounds 1 of several combinations of these 4 circuits. The windshield wiper motor interprets these ground signals and performs the action requested. The multifunction switch is grounded through circuit 57 (BK).

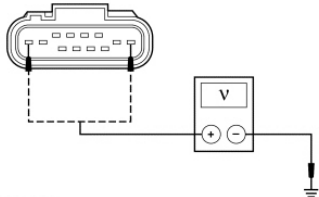
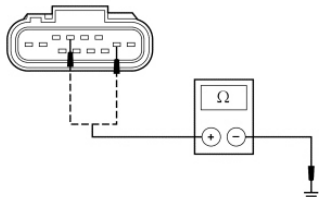
**This pinpoint test is intended to diagnose the following:**

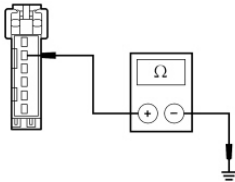
Normal Operation

- Fuse(s)
- Wiring, terminals or connectors
- Multifunction switch
- Windshield wiper motor

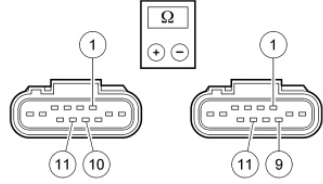
**PINPOINT TEST A: THE WIPERS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>A1 CHECK THE VOLTAGE TO THE WIPER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Windshield Wiper Motor C125.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between windshield wiper motor C125-5, circuit 2025 (RD/YE), harness side and ground; and between windshield wiper motor C125-8, circuit 65 (DG), harness side and ground.</li> </ul>  <p>A0045928</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> VERIFY BJB fuse 110 (30A) and CJB fuse 7 (10A) are OK. If OK, REPAIR the circuit. TEST the system for normal operation.</p> <p>If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. REPAIR the circuit. TEST the system for normal operation.</p>
<b>A2 CHECK FOR AN OPEN GROUND CIRCUIT TO THE WIPER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and: <ul style="list-style-type: none"> <li>◆ For early build vehicles, the windshield wiper motor C125-6, circuit 57 (BK), harness side; and between windshield wiper motor C125-3, circuit 676 (PK/OG), harness side.</li> <li>◆ For late build vehicles, the windshield wiper motor C125-6, circuit 57 (BK), harness side.</li> </ul> </li> </ul>  <p>A0037610</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> REPAIR the circuit(s) in question. TEST the system for normal operation.</p>

<b>A3 CHECK THE MULTIFUNCTION SWITCH</b>																						
<ul style="list-style-type: none"><li>• Disconnect: Multifunction Switch C202b.</li><li>• Carry out the Multifunction Switch component test.</li></ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"><li>• <b>Does the multifunction switch pass the component test?</b></li></ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> .</p>																					
<b>A4 CHECK FOR AN OPEN GROUND CIRCUIT TO THE MULTIFUNCTION SWITCH</b>																						
<ul style="list-style-type: none"><li>• Measure the resistance between multifunction switch C202B-5, circuit 57 (BK), harness side and ground.</li></ul> <div></div> <p>N0025872</p> <ul style="list-style-type: none"><li>• <b>Is the resistance less than 5 ohms?</b></li></ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>																					
<b>A5 CHECK FOR SHORTS IN THE WINDSHIELD WIPER MOTOR HARNESS</b>																						
<ul style="list-style-type: none"><li>• Measure the resistance at windshield wiper motor C125, harness side, between the circuits shown in the following chart.</li></ul> <table><tr><th>Windshield Wiper Motor</th><th>Circuits</th><th>Windshield Wiper Motor</th></tr><tr><td>C125-10</td><td>56 (DB/OG)/ 61 (YE/RD)</td><td>C125-1</td></tr><tr><td>C125-10</td><td>56 (DB/OG)/63 (RD)</td><td>C125-9</td></tr><tr><td>C125-10</td><td>56 (DB/OG)/58 (WH)</td><td>C125-11</td></tr><tr><td>C125-11</td><td>58 (WH)/61 (YE/RD)</td><td>C125-1</td></tr><tr><td>C125-11</td><td>58 (WH)/63 (RD)</td><td>C125-9</td></tr><tr><td>C125-1</td><td>61 (YE/RD)/63 (RD)</td><td>C125-9</td></tr></table>	Windshield Wiper Motor	Circuits	Windshield Wiper Motor	C125-10	56 (DB/OG)/ 61 (YE/RD)	C125-1	C125-10	56 (DB/OG)/63 (RD)	C125-9	C125-10	56 (DB/OG)/58 (WH)	C125-11	C125-11	58 (WH)/61 (YE/RD)	C125-1	C125-11	58 (WH)/63 (RD)	C125-9	C125-1	61 (YE/RD)/63 (RD)	C125-9	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
Windshield Wiper Motor	Circuits	Windshield Wiper Motor																				
C125-10	56 (DB/OG)/ 61 (YE/RD)	C125-1																				
C125-10	56 (DB/OG)/63 (RD)	C125-9																				
C125-10	56 (DB/OG)/58 (WH)	C125-11																				
C125-11	58 (WH)/61 (YE/RD)	C125-1																				
C125-11	58 (WH)/63 (RD)	C125-9																				
C125-1	61 (YE/RD)/63 (RD)	C125-9																				



 <p>N0091498</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms for all measurements?</li> </ul>	
<b>A6 CHECK FOR CORRECT WIPER MOTOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all wiper motor connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> </ul> </li> <li>• Connect all wiper motor connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new windshield wiper motor. REFER to <u>Wiper Motor</u> in this section.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

### Pinpoint Test B: The Wipers Stay On Continuously

Refer to Wiring Diagrams Cell 81 , Front Wipers and Washers for schematic and connector information.

#### Normal Operation

The windshield wiper motor receives open and ground inputs from the multifunction switch through circuits 56 (DB/OG), 58 (WH), 61 (YE/RD) and 63 (RD). When a wiper function is selected, the multifunction switch grounds 1 of several combinations of these 4 circuits. The windshield wiper motor interprets these ground signals and performs the action requested. The multifunction switch is grounded through circuit 57 (BK).

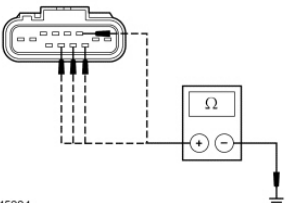
#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- Windshield wiper motor

### PINPOINT TEST B: THE WIPERS STAY ON CONTINUOUSLY

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>B1 CHECK THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202B.</li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p>

<ul style="list-style-type: none"> <li>• Carry out the Multifunction Switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Does the multifunction switch pass the component test?</b></li> </ul>	<p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> .</p>
<p><b>B2 CHECK CIRCUITS 56 (DB/OG), 58 (WH), 61 (YE/RD) AND 63 (RD) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Windshield Wiper Motor C125.</li> <li>• Measure the resistance between ground and windshield wiper motor:             <ul style="list-style-type: none"> <li>◆ 125-1, circuit 61 (YE/RD), harness side.</li> <li>◆ 125-9, circuit 63 (RD), harness side.</li> <li>◆ 125-10, circuit 56 (DB/OG), harness side.</li> <li>◆ 125-11, circuit 58 (WH), harness side.</li> </ul> </li> </ul>  <p>A0045224</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>B3 CHECK FOR CORRECT WIPER MOTOR OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all wiper motor connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> </ul> </li> <li>• Connect all wiper motor connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new windshield wiper motor. REFER to <u>Wiper Motor</u> in this section.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

### Pinpoint Test C: The High/Low Wiper Speeds Do Not Operate Correctly

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

**Normal Operation**

The windshield wiper motor receives open and ground inputs from the multifunction switch through circuits 56 (DB/OG), 58 (WH), 61 (YE/RD) and 63 (RD). When a wiper function is selected, the multifunction switch grounds 1 of several combinations of these 4 circuits. The windshield wiper motor interprets these ground signals and performs the action requested. The multifunction switch is grounded through circuit 57 (BK).

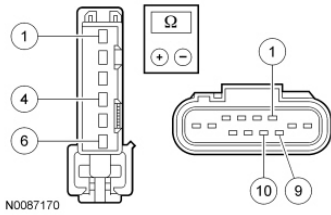
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Multifunction switch
- Windshield wiper motor

**PINPOINT TEST C: THE HIGH/LOW WIPER SPEEDS DO NOT OPERATE CORRECTLY**

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

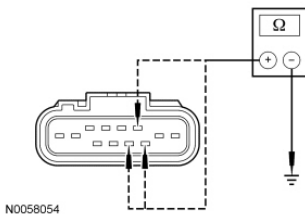
Test Step	Result / Action to Take												
<b>C1 CHECK THE MULTIFUNCTION SWITCH</b>													
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Multifunction Switch C202B.</li><li>• Carry out the Multifunction Switch component test.</li></ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"><li>• <b>Does the multifunction switch pass the component test?</b></li></ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> .</p>												
<b>C2 CHECK CIRCUITS 56 (DB/OG), 61 (YE/RD) AND 63 (RD) FOR OPENS</b>													
<ul style="list-style-type: none"><li>• Disconnect: Windshield Wiper Motor C125.</li><li>• Measure the resistance between multifunction switch C202B harness side and windshield wiper motor C125 harness side using the following chart:</li></ul> <table border="1"><thead><tr><th>Multifunction Switch</th><th>Circuit</th><th>Windshield Wiper Motor</th></tr></thead><tbody><tr><td>C202B-1</td><td>61 (YE/RD)</td><td>C125-1</td></tr><tr><td>C202B-4</td><td>63 (RD)</td><td>C125-9</td></tr><tr><td>C202B-6</td><td>56 (DB/OG)</td><td>C125-10</td></tr></tbody></table>	Multifunction Switch	Circuit	Windshield Wiper Motor	C202B-1	61 (YE/RD)	C125-1	C202B-4	63 (RD)	C125-9	C202B-6	56 (DB/OG)	C125-10	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
Multifunction Switch	Circuit	Windshield Wiper Motor											
C202B-1	61 (YE/RD)	C125-1											
C202B-4	63 (RD)	C125-9											
C202B-6	56 (DB/OG)	C125-10											



- Are the resistances less than 5 ohms?

### C3 CHECK CIRCUITS 56 (DB/OG), 61 (YE/RD) AND 63 (RD) FOR SHORTS

- Measure the resistance between ground and windshield wiper motor:
  - ◆ 125-1, circuit 61 (YE/RD), harness side.
  - ◆ 125-9, circuit 63 (RD), harness side.
  - ◆ 125-10, circuit 56 (DB/OG), harness side.



- Is the resistance greater than 10,000 ohms?

**Yes**  
GO to C4.

**No**  
REPAIR circuit in question. TEST for normal operation.

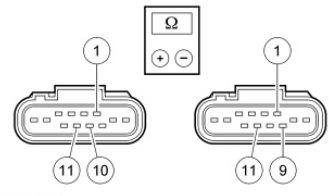
### C4 CHECK FOR SHORTS IN THE WINDSHIELD WIPER MOTOR HARNESS

- Measure the resistance at windshield wiper motor C125, harness side between the circuits shown in the following chart.

Windshield Wiper Motor	Circuits	Windshield Wiper Motor
C125-10	56 (DB/OG)/ 61 (YE/RD)	C125-1
C125-10	56 (DB/OG)/63 (RD)	C125-9
C125-10	56 (DB/OG)/58 (WH)	C125-11
C125-11	58 (WH)/61 (YE/RD)	C125-1
C125-11	58 (WH)/63 (RD)	C125-9
C125-1	61 (YE/RD)/63 (RD)	C125-9

**Yes**  
GO to C5.

**No**  
REPAIR the circuit. TEST the system for normal operation.

 <p>• Is the resistance greater than 10,000 ohms for all measurements?</p>	
<b>C5 CHECK FOR CORRECT WIPER MOTOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all wiper motor connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> </ul> </li> <li>• Connect all wiper motor connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new windshield wiper motor. REFER to <u>Wiper Motor</u> in this section.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

### Pinpoint Test D: The Intermittent Wiper Speed Does Not Operate Correctly

Refer to Wiring Diagrams Cell 81 , Wipers and Washers for schematic and connector information.

#### Normal Operation

The windshield wiper motor receives open and ground inputs from the multifunction switch through circuits 56 (DB/OG), 58 (WH), 61 (YE/RD) and 63 (RD). When a wiper function is selected, the multifunction switch grounds 1 of several combinations of these 4 circuits. The windshield wiper motor interprets these ground signals and performs the action requested. The multifunction switch is grounded through circuit 57 (BK).

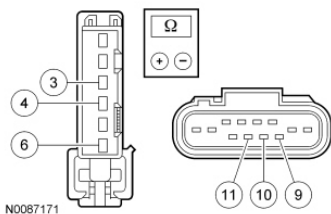
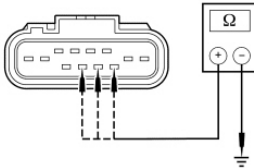
#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- Windshield wiper motor

### PINPOINT TEST D: THE INTERMITTENT WIPER SPEED DOES NOT OPERATE CORRECTLY

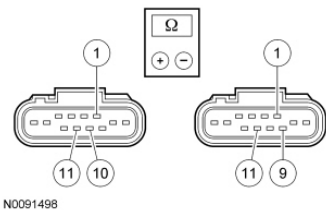
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>D1 CHECK THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction switch C202b.</li> <li>• Carry out the Multifunction Switch component test.</li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> INSTALL a new multifunction</p>

Refer to Wiring Diagrams Cell <u>149</u> for component testing. • <b>Does the multifunction switch pass the component test?</b>	switch. REFER to <u>Section 211-05</u> .												
<b>D2 CHECK CIRCUITS 56 (DB/OG), 58 (WH) AND 63 (RD) FOR OPENS</b>													
<ul style="list-style-type: none"><li>• Disconnect: Windshield Wiper Motor C125.</li><li>• Measure the resistance between multifunction switch C202B harness side and windshield wiper motor C125 harness side using the following chart:</li></ul> <table border="1"><thead><tr><th>Multifunction Switch</th><th>Circuit</th><th>Windshield Wiper Motor</th></tr></thead><tbody><tr><td>C202B-3</td><td>58 (WH)</td><td>C125-11</td></tr><tr><td>C202B-4</td><td>63 (RD)</td><td>C125-9</td></tr><tr><td>C202B-6</td><td>56 (DB/OG)</td><td>C125-10</td></tr></tbody></table>  <p>N0087171</p> <ul style="list-style-type: none"><li>• <b>Are the resistances less than 5 ohms?</b></li></ul>	Multifunction Switch	Circuit	Windshield Wiper Motor	C202B-3	58 (WH)	C125-11	C202B-4	63 (RD)	C125-9	C202B-6	56 (DB/OG)	C125-10	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
Multifunction Switch	Circuit	Windshield Wiper Motor											
C202B-3	58 (WH)	C125-11											
C202B-4	63 (RD)	C125-9											
C202B-6	56 (DB/OG)	C125-10											
<b>D3 CHECK CIRCUITS 56 (DB/OG), 58 (WH) AND 63 (RD) FOR A SHORT TO GROUND</b>													
<ul style="list-style-type: none"><li>• Measure the resistance between ground and windshield wiper motor:<ul style="list-style-type: none"><li>◆ 125-9, circuit 63 (RD), harness side.</li><li>◆ 125-10, circuit 56 (DB/OG), harness side.</li><li>◆ 125-11, circuit 58 (WH), harness side.</li></ul></li></ul>  <p>N0058187</p> <ul style="list-style-type: none"><li>• <b>Is the resistance greater than 10,000 ohms?</b></li></ul>	<p><b>Yes</b> GO to <u>D4</u> .</p> <p><b>No</b> REPAIR the circuit(s) in question. TEST the system for normal operation.</p>												
<b>D4 CHECK FOR SHORTS IN THE WINDSHIELD WIPER MOTOR HARNESS</b>													

- Measure the resistance at windshield wiper motor C125, harness side, between the circuits shown in the following chart.

Windshield Wiper Motor	Circuits	Windshield Wiper Motor
C125-10	56 (DB/OG)/ 61 (YE/RD)	C125-1
C125-10	56 (DB/OG)/63 (RD)	C125-9
C125-10	56 (DB/OG)/58 (WH)	C125-11
C125-11	58 (WH)/61 (YE/RD)	C125-1
C125-11	58 (WH)/63 (RD)	C125-9
C125-1	61 (YE/RD)/63 (RD)	C125-9



- Is the resistance greater than 10,000 ohms for all measurements?

**Yes**GO to **D5**.**No**

REPAIR the circuit. TEST the system for normal operation.

#### **D5 CHECK FOR CORRECT WIPER MOTOR OPERATION**

- Disconnect all wiper motor connectors.
- Check for:
  - ◆ corrosion.
  - ◆ pushed-out pins.
- Connect all wiper motor connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- Is the concern still present?

**Yes**INSTALL a new windshield wiper motor. REFER to Wiper Motor in this section.**No**

The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.

#### **Pinpoint Test E: The Washer Pump is Inoperative**

Refer to Wiring Diagrams Cell **81**, Wipers and Washers for schematic and connector information.

**Normal Operation**

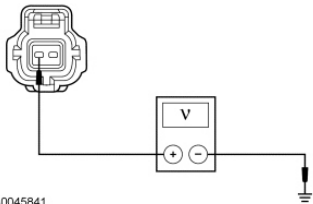
When the wash function is selected by the operator, the multifunction switch grounds circuit 680 (LB/OG) to the windshield wiper motor. The windshield wiper motor interprets this ground signal and energizes the internal washer relay. Voltage is sent to the washer pump from the windshield wiper motor through circuit 941 (BK/WH). The windshield washer pump motor is grounded through circuit 57 (BK). The multifunction switch is grounded through circuit 57 (BK).

**This pinpoint test is intended to diagnose the following:**

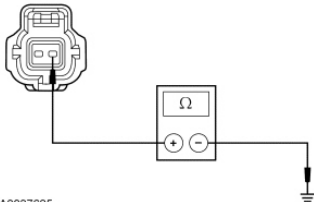
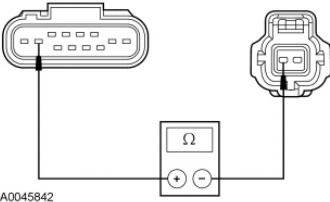
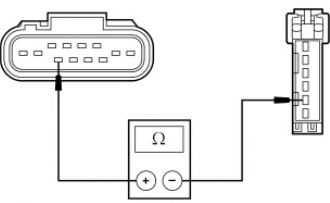
- Wiring, terminals or connectors
- Multifunction switch
- Windshield washer pump
- Windshield wiper motor

**PINPOINT TEST E: THE WASHER PUMP IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>E1 CHECK THE WASHER PUMP MOTOR FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Windshield Washer Pump C137.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between windshield washer pump C137-1, circuit 941 (BK/WH), harness side and ground while depressing the multifunction switch to the wash position.</li> </ul>  <p>A0045841</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> GO to <u>E3</u> .</p>
<b>E2 CHECK CIRCUIT 57 (BK) FOR GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the windshield washer pump C137-2, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new windshield washer pump. REFER to <u>Washer Pump and Reservoir</u> in this section.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>



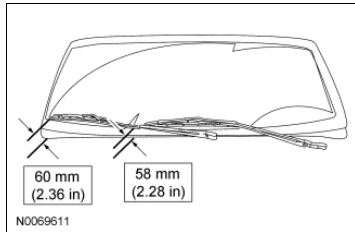
 <p>A0037625</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>E3 CHECK CIRCUIT 941 (BK/WH) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Windshield Wiper Motor C125.</li> <li>• Measure the resistance between windshield wiper motor C125-7, circuit 941 (BK/WH), harness side and windshield washer pump C137-1, circuit 941 (BK/WH), harness side.</li> </ul>  <p>A0045842</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>E4 CHECK THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202B.</li> <li>• Carry out the Multifunction Switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• Does the multifunction switch pass the component test?</li> </ul>	<p><b>Yes</b> GO to <u>E5</u> .</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> .</p>
<b>E5 CHECK CIRCUIT 680 (LB/OG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between windshield wiper motor C125-12, circuit 680 (LB/OG), harness side and multifunction switch C202B-2, circuit 680 (LB/OG), harness side.</li> </ul>  <p>N0025875</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E6</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

<b>E6 CHECK FOR CORRECT WIPER MOTOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all wiper motor connectors.</li> <li>• Check for:               <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> </ul> </li> <li>• Connect all wiper motor connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b>            INSTALL a new windshield wiper motor. REFER to <u>Wiper Motor</u> in this section.</p> <p><b>No</b>            The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>

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### Wiper Blade and Pivot Arm Adjustment

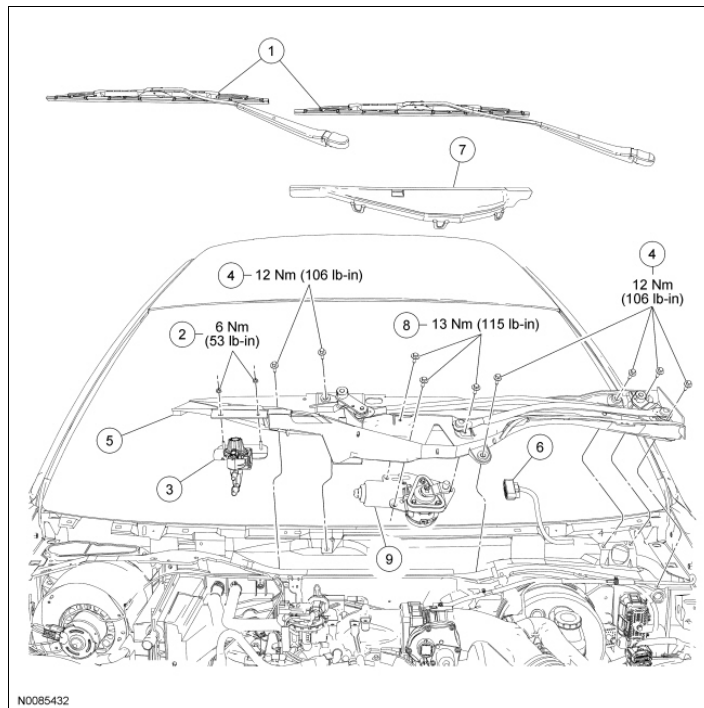
1. Cycle and park the windshield wipers.
2. Verify that the RH and LH wiper blades are located at the specified position.



3. **NOTE:** Make sure there is no mechanical binding in the linkage preventing the wiper arms from returning to the fully parked position.

If not within the specification, remove the wiper pivot arms and reposition to the correct location. For additional information, refer to Wiper Pivot Arm in this section.

---

**Wiper and Washer System - Exploded View**

Item	Part Number	Description
1	17527	Wiper pivot arms (2 required)
2	N620479-S	Evaporative emission canister purge valve nuts (2 required)
3	9C915	Evaporative emission canister purge valve
4	N610021-S	Wiper mounting arm and pivot shaft bolts (6 required)
5	17566	Wiper mounting arm and pivot shaft
6	-	Windshield wiper motor electrical connector (part of 14290)
7	-	Windshield wiper motor cover (part of 17566)
8	N605771-S	Windshield wiper motor bolts (3 required)
9	17504	Windshield wiper motor

1. For additional information, refer to the procedures in this section.



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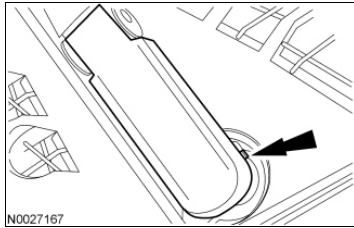
## Wiper Pivot Arm

### Removal and Installation

1. **NOTE:** To gain additional clearance, activate the wipers and cycle the key OFF when the wipers reach their highest point on the windshield.

Lift the wiper pivot arm to the full upright position.

2. Release the locking tab and remove the wiper pivot arm.



3. **NOTE:** During installation, it is necessary to pull the locking tab out to its full open (unlatched) position and hold while assembling the pivot arm onto the mounting arm and pivot shaft. Align the key on the pivot arm head with the keyway on the shafts. This makes sure the pivot arm is correctly aligned. If necessary, the keyway can be removed. To adjust the wiper pivot arms, refer to Wiper Blade and Pivot Arm Adjustment in this section.

To install, reverse the removal procedure.

---

## **Wiper Mounting Arm and Pivot Shaft**

### **Removal and Installation**

1. Remove the cowl panel grille. For additional information, refer to Section 501-02 .
  2. Remove the 2 nuts and position the evaporative emission canister purge valve aside.
    - To install, tighten to 6 Nm (53 lb-in).
  3. Remove the 6 bolts and position the wiper mounting arm and pivot shaft aside.
    - To install, tighten to 12 Nm (106 lb-in).
  4. Disconnect the 2 harness pushpins and the windshield wiper motor electrical connector.
  5. Disconnect the windshield washer hose and remove the wiper mounting arm and pivot shaft.
  6. Remove the wiper motor assembly. For additional information, refer to Wiper Motor in this section.
  7. To install, reverse the removal procedure.
-

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## Wiper Motor

### Removal and Installation

**NOTE:** A new wiper motor assembly comes with the linkage arm installed.

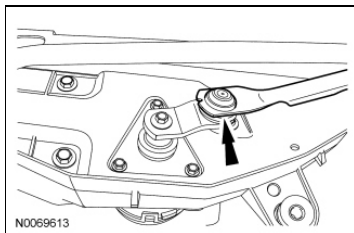
1. Remove the windshield wiper motor cover.
2. **NOTE:** If the wiper motor is inoperative, manually rotate the wiper motor linkage until the wipers reach their highest point on the windshield.

Remove the wiper mounting arm and pivot shaft assembly. For additional information, refer to Wiper Mounting Arm and Pivot Shaft in this section.

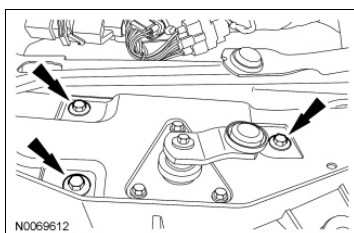
3. **NOTICE:** Do not remove the wiper motor linkage arm from the wiper motor assembly. If the arm is removed, the wiper arms may not park in the correct location.

Separate the wiper motor linkage arm from the wiper mounting arm and pivot shaft assembly.

- Use a suitable tool at the location shown to separate the wiper linkage arm from the wiper mounting arm and pivot shaft assembly.



4. Remove the 3 bolts and remove the windshield wiper motor.
  - To install, tighten to 13 Nm (115 lb-in).



5. To install, reverse the removal procedure.
-

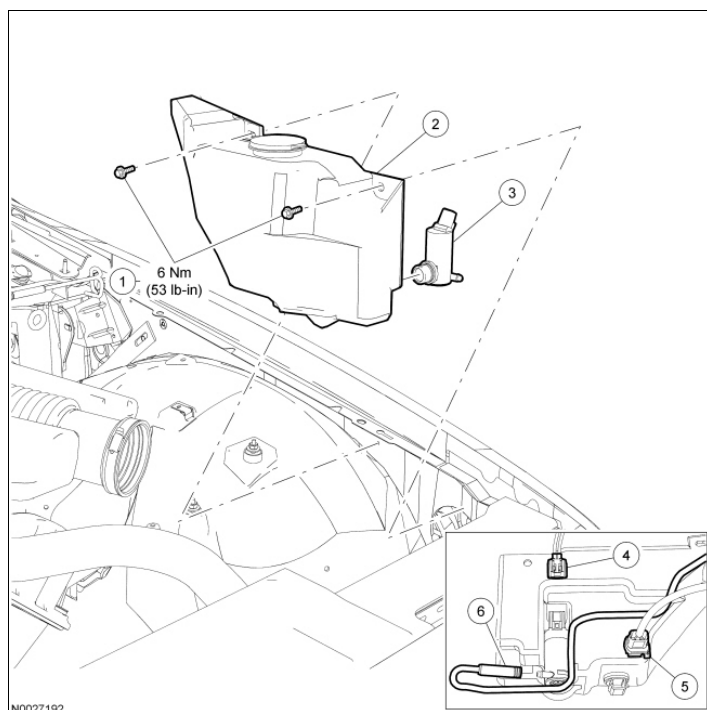




**Washer Pump and Reservoir**

## Material

Item	Specification
Motorcraft® Premium Windshield Washer Concentrate (US) ZC-32-A or B (US)	WSB-M8B16-A2
Motorcraft® Premium Quality Windshield Washer Fluid (Canada) CXC-37-(A, B, D, and F) (Canada)	-



Item	Part Number	Description
1	-	Windshield washer pump reservoir bolts (2 required)
2	17618	Windshield washer pump reservoir
3	17664	Windshield washer pump
4	-	Windshield washer pump electrical connector (part of 14290)
5	-	Washer fluid level switch electrical connector (part of 14290)
6	17K605	Windshield washer hose

**Removal and Installation**

1. Remove the air cleaner assembly. For additional information, refer to [Section 303-12](#).
2. Remove the 2 bolts and position the windshield washer pump and reservoir aside.

- To install, tighten to 6 Nm (53 lb-in).

3. Disconnect the electrical connectors.

4. **⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTE:** Windshield washer fluid should be collected in a container after the windshield washer hose is disconnected.

Disconnect the windshield washer hose and remove the windshield washer pump and reservoir.

5. Remove the windshield washer pump from the reservoir.

6. **NOTICE:** Do not operate the windshield washer pump prior to filling the windshield reservoir. Failure to follow this instruction may result in premature pump failure.

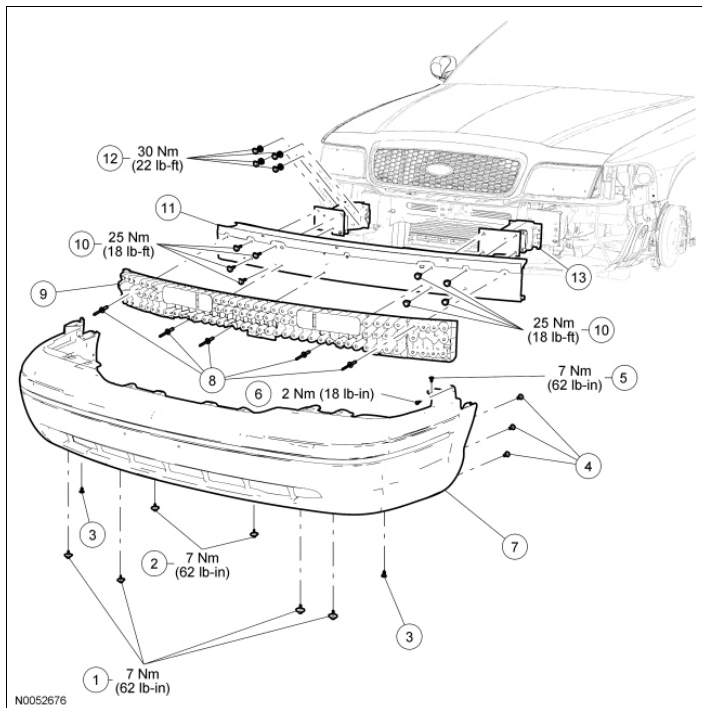
To install, reverse the removal procedure.

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**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Front bumper bolts	25	18	-
Front bumper bracket nuts	30	22	-
Front bumper cover screws	7	-	62
Front bumper cover-to-fender screws	2	-	18
Lower radiator air deflector bolts	7	-	62
Radiator vertical deflector bolts	7	-	62
Rear bumper bracket bolt	90	66	-
Rear bumper cover nuts	7	-	62
Rear bumper nuts	40	30	-

---


**Bumper - Exploded View, Front**


Item	Part Number	Description
1	N808841	Lower radiator air deflector bolts (4 required)
2	N808841	Radiator vertical deflector bolts (2 required)
3	388577	Pin-type retainers (2 required)
4	390018	Front bumper cover pin-type retainers (6 required)
5	N808841	Front bumper cover bolt (2 required)
6	N800322	Front bumper cover-to-fender screw (2 required)
7	17D957	Front bumper cover
8	W701913	Front bumper isolator rivets (5 required)
9	17E898	Front bumper isolator
10	W505434	Front bumper bolts (8 required)
11	17750	Front bumper
12	W520513	Front bumper bracket nuts (4 required)
13	17752 RH/ 17753 LH	Front bumper brackets

1. For additional information, refer to the procedures in this section.



**Bumper Cover - Front****Removal and Installation**

1.  **WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

 **WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .


2. Remove the 4 lower radiator air deflector bolts and the 2 radiator vertical deflector bolts.
    - To install, tighten to 7 Nm (62 lb-in).
  3. Remove the 2 pin-type retainers (1 each side).
  4. Remove the 6 front bumper cover pin-type retainers (3 each side).
  5. Remove the side turn signal lamp assemblies. For additional information, refer to [Section 417-01](#) .
  6. Remove the 2 front bumper cover screws (1 each side).
    - To install, tighten to 7 Nm (62 lb-in).
  7. Remove the 2 front bumper cover-to-fender screws (1 each side).
    - To install, tighten to 2 Nm (18 lb-in).
  8. If equipped, disconnect the fog lamp electrical connectors and remove the front bumper cover.
  9. To install, reverse the removal procedure.
-





## Bumper Isolator - Front

### Special Tool(s)

	<p>Heavy-Duty Riveter 501-D011 (D80L-23200-A) or equivalent</p>
---	---

### Removal and Installation

1. Remove the front bumper cover. For additional information, refer to Bumper Cover - Front in this section.
2. Remove the 5 front bumper isolator rivets and the 2 front bumper isolator halves.
3. To install, reverse the removal procedure.
  - Use the Heavy-Duty Riveter to install the new rivets.

## **Bumper - Front**

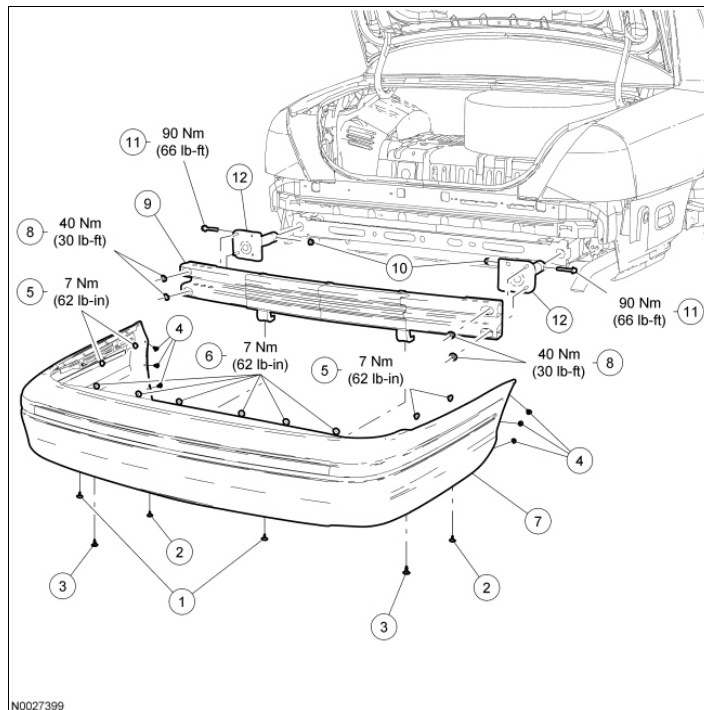
### **Removal and Installation**

1. Remove the front bumper isolator. For additional information, refer to Bumper Isolator - Front in this section.
  2. Remove the 8 front bumper bolts (4 each side) and the front bumper.
    - To install, tighten to 25 Nm (18 lb-ft).
  3. To install, reverse the removal procedure.
-

## **Bumper Bracket - Front**

### **Removal and Installation**

1. Remove the front bumper. For additional information, refer to Bumper Isolator - Front in this section.
  2. Remove the 8 front bumper bracket nuts (4 each side), front bumper brackets and the front bumper bracket plates.
    - To install, tighten to 30 Nm (22 lb-ft).
  3. To install, reverse the removal procedure.
-

**Bumper - Exploded View, Rear**

Item	Part Number	Description
1	W707938	Rear bumper cover screws (2 required)
2	W707938	Rear bumper cover screws (2 required)
3	388930	Rear bumper cover pin-type retainers (2 required)
4	390018	Rear bumper cover pin-type retainers (6 required)
5	N621927	Rear bumper cover nuts (4 required)
6	N621927	Rear bumper cover nuts (6 required)
7	17K835	Rear bumper cover
8	W709361	Rear bumper nuts (4 required)
9	17775	Rear bumper
10	N800169	Rear bumper bracket nuts (2 required)
11	N811799	Rear bumper bracket bolts (2 required)
12	17D788 RH/ 17D864 LH	Rear bumper brackets

1. For additional information, refer to the procedures in this section.



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**Bumper Cover - Rear****Removal and Installation**

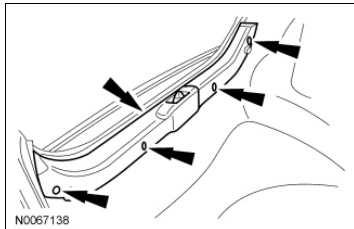
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Depower the fire suppression system, if equipped. For additional information, refer to **Section 100-02B**.

2. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A**.

3. Remove the 2 rear bumper cover screws.
4. Remove the 2 rear bumper cover screws and the 2 rear bumper cover pin-type retainers (1 each side).
5. Remove the 6 rear bumper cover pin-type retainers (3 each side).
6. Remove the pin-type retainers and the luggage compartment rear trim panel.
  - Position the luggage compartment lining material aside.



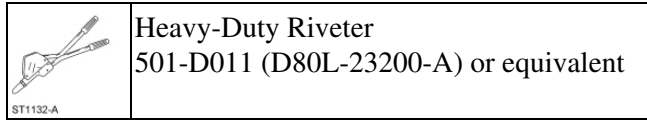
7. Remove the 4 rear bumper cover nuts (2 each side).
    - To install, tighten to 7 Nm (62 lb-in).
  8. Remove the 6 rear bumper cover nuts (3 each side) and the rear bumper cover.
    - To install, tighten to 7 Nm (62 lb-in).
  9. To install, reverse the removal procedure.
-



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**Bumper - Rear**

Special Tool(s)

**Removal and Installation**

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

1. Remove the rear bumper cover. For additional information, refer to Bumper Cover - Rear in this section.
  2. Remove the 4 rear bumper nuts (2 each side) and the rear bumper.
    - To install, tighten to 40 Nm (30 lb-ft).
  3. If necessary, remove the 2 rear bumper cover brackets and rivets.
  4. To install, reverse the removal procedure.
    - Use the Heavy-Duty Riveter to install the new rivets.
-



## Bumper Bracket - Rear

### Removal

**NOTICE:** Never apply heat to the bumper isolator and bracket. Heat could cause the material inside the bumper isolator and bracket to expand and leak. Heat may also crack the metal housing. Always remove the bumper isolator and bracket before carrying out body frame service near them.

1. Remove the rear bumper. For additional information, refer to Bumper - Rear in this section.
2. **NOTE:** LH shown, RH similar.

Remove the bolt and the rear bumper bracket.

### Installation

1. Inspection must be made prior to reusing the bumper isolator and bracket. If the bumper isolator and bracket do not meet any one of the inspection criteria listed below, install a new bumper isolator and bracket.
    - There must be no visible fluid leaks.
    - There must be no deformation to the inner or outer cylinders.
    - At ambient temperatures, the outer cylinder must not turn (by hand), relative to the inner cylinder.
    - Place the bumper isolator and bracket in an arbor press or an equivalent press mechanism, and stroke the bumper isolator and bracket approximately 13 mm (1/2 in) to determine whether it returns to its original length. If it does not return to its original length, it must be replaced. A bumper isolator and bracket that does not return to its original length may have developed loss of pressure or fluid that would prevent it from functioning correctly in subsequent impacts.
    - Minor straightening of the bumper isolator and bracket is permissible, provided there are no visible leaks and the bumper isolator and bracket function correctly.
  2. Install the rear bumper bracket and bolt.
    - Tighten to 90 Nm (66 lb-ft).
  3. Install the rear bumper. For additional information, refer to Bumper - Rear in this section.
-



**Torque Specifications**

Description	Nm	lb-ft	lb-in
<b>Front Safety Belts</b>			
D-ring bolt	40	30	-
Safety belt anchor bolt	40	30	-
Safety belt buckle nut (driver and passenger)	48	35	-
Safety belt retractor and pretensioner bolt	40	30	-
Safety belt shoulder height adjuster bolts	40	30	-
Seat track-to-floor bolts	25	18	-
Seat track-to-floor nut, inboard	80	59	-
Seat track-to-floor nut, outboard	25	18	-
Side impact sensor bolts	12	-	106
<b>Rear Safety Belts</b>			
Center safety belt retractor bolt	40	30	-
Child safety seat tether anchor bolt	25	18	-
D-ring bolt	40	30	-
Lower anchors and tethers for children bolt	18	-	159
Rear seat backrest nut	55	41	-
Safety belt anchor bolt	55	41	-
Safety belt buckle nut	55	41	-
Safety belt retractor bolt	40	30	-



---

## Safety Belt System

**⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:**

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

When installing new safety belt buckles and/or retractor assemblies, use only the replacement parts specified in the Ford Customer Service Division Master Parts and Accessories Catalog.

## Active Restraint System Components

The active restraint system consists of the following serviceable items:

- Safety belt shoulder height adjusters attached to the LH and RH B-pillars
- Front safety belt retractors attached to the LH and RH B-pillars
- Rear LH and RH safety belt retractors attached to the body behind the quarter trim panels
- Rear center safety belt retractor attached to the body at the parcel shelf
- Front safety belt buckles attached to the driver and front passenger seat tracks
- Front center safety belt and buckle attached with the seat track rear inboard mounting fasteners on the driver and front passenger seats
- Rear safety belt buckles (LH, RH and center) attached to the floor pan underneath the rear seat cushion
- Child safety seat tether anchors attached to the parcel shelf
- Lower anchors and tethers for children attached to the floor pan underneath the rear seat cushion at the RH and LH rear seating positions

## Safety Belt Retractors

The safety belt retractors consist of the following features:

- Safety belt pretensioner (front only)
- Dual locking mode
  - ◆ Emergency Locking Retractor (ELR)
  - ◆ Automatic Locking Retractor (ALR) (all except driver seat)

### **Safety Belt Retractor and Pretensioner**

The front safety belt retractors are equipped with pretensioners that operate as part of the Supplemental Restraint System (SRS). The pretensioner is a pyrotechnic device that deploys when activated by the Restraints Control Module (RCM) to remove excess safety belt webbing from the shoulder and lap safety belt in the event of an impact. If a deployment of the safety belt retractor and pretensioners occurs, a new assembly must be installed. Refer to Safety Belt Retractor and Pretensioner in this section.

For safety belt retractor and pretensioner diagnostic and disposal information, refer to Section 501-20B .

### **Emergency Locking Retractor (ELR)**

Every safety belt retractor is a 3-point restraint with the ELR feature. The safety belt retractor is designed to allow the occupant freedom of movement in normal operation. The ELR is a vehicle sensitive feature designed to activate and lock the safety belt webbing when braking hard, cornering hard or in an impact of approximately 8 km/h (5 mph). The ELR feature helps to reduce the forward movement of the driver and passengers. Refer to the appropriate Functional Test procedure in Safety Belt System in this section.

### **Automatic Locking Retractor (ALR)**

The ALR mode is used when locking a child seat in an outboard seating position or when a tight belt fit is desired. The ALR mode is automatically activated when the safety belt webbing is fully extracted from the retractor and then allowed to retract. As the safety belt webbing is retracted back onto the spool, an audible clicking sound is made indicating the safety belt retractor is in ALR mode and the safety belt webbing will not pull back out of the safety belt retractor. To disengage the ALR mode, allow the safety belt webbing to fully retract back onto the spool. The ALR mode is disengaged when the webbing is free to extract and retract back into the retractor. Refer to the appropriate Functional Test procedure in Safety Belt System in this section.

### **Safety Belt Buckles**

#### **Front Safety Belt Buckles**

The front outboard seat safety belt buckles are attached to the front seat tracks and can be serviced separately. The center safety belt and safety belt buckle are attached to the front seat inboard mounting studs and are also serviced separately.

#### **Belt Tension Sensor (BTS)**

The Belt Tension Sensor (BTS) is part of the passenger front safety belt buckle and can only be serviced with a new passenger safety belt buckle. The BTS operates as part of the Occupant Classification Sensor (OCS) system on the front passenger seat. To diagnose the BTS or OCS system, refer to Section 501-20B .

#### **Rear Safety Belt Buckles**

The rear seat safety belt buckles are attached to the floor pan behind the rear seat cushion and can be serviced separately.

### **Child Safety Seat Restraints**

The child safety seat restraints include the following serviceable items:

- Child safety seat tether anchors located at all rear seating positions, attached to the parcel shelf
- Lower anchors and tethers for children attachments located at the outboard seating positions, mounted to the floor pan behind the rear seat cushion

If a child safety seat was in use during a collision, inspect the vehicle portion of the system for damage. Inspect the vehicle structure at the child safety seat component mounting areas and repair any damage to the original production configuration.

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## Safety Belt System

### Principles of Operation

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

### Safety Belt Warning System

The conditions of operation for the driver safety belt warning indicator and chime are as follows:

- If the driver safety belt is not buckled before the ignition switch is turned to RUN, then the safety belt warning indicator illuminates for 1 to 2 minutes and the warning chime sounds for 4 to 8 seconds.
- If the driver safety belt is buckled while the warning indicator is illuminated and the warning chime is sounding, then the safety belt warning indicator and warning chime turn off.
- If the driver safety belt is buckled before the ignition switch is turned to ON, the safety belt warning indicator and warning chime will remain off.

### Belt-Minder®

The Belt-Minder® feature is a supplemental warning to the safety belt warning function. This feature provides an additional reminder to the driver that the driver and/or front passenger safety belt is unbuckled by intermittently sounding a chime and illuminating the safety belt warning indicator in the Instrument Cluster (IC) module.

Either the driver or front passenger safety belt systems may activate the Belt-Minder®. If the Belt-Minder® warnings have expired (warnings for approximately 5 minutes) for one occupant (driver or front passenger), the other occupant can still activate the Belt-Minder® feature.



The passenger Belt-Minder® feature is activated only when the Occupant Classification Sensor (OCS) system detects a passenger in the right front seat and the passenger weight exceeds a programmed limit. For information on the OCS system, refer to [Section 501-20B](#) .

To activate or deactivate the Belt-Minder® feature, refer to [Section 413-01](#) .

If...	Then...
the driver and/or front passenger safety belt is buckled before the ignition switch is turned to the ON position or less than 1-2 minutes have elapsed since the ignition switch has been turned ON...	the Belt-Minder® feature will not activate.
the driver and/or front passenger safety belt is not buckled before the vehicle has reached at least 5 km/h (3 mph) and 1-2 minutes have elapsed since the ignition switch has been turned to ON...	the Belt-Minder® feature is activated - the safety belt warning indicator illuminates and the warning chime sounds for 6 seconds every 30 seconds, repeating for approximately 5 minutes or until the safety belt(s) is buckled.
the driver or front passenger safety belt becomes unbuckled for approximately 1 minute while the vehicle is traveling at least 5 km/h (3 mph) and more than 1-2 minutes have elapsed since the ignition switch has been turned to ON...	the Belt-Minder® feature is activated - the safety belt warning indicator illuminates and the warning chime sounds for 6 seconds every 30 seconds, repeating for approximately 5 minutes or until the safety belt(s) is buckled.

### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern by operating the active restraint system to duplicate the condition.
2. Inspect to determine if any of the following mechanical or electrical concerns apply:

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Safety belt webbing integrity (torn, frayed, cut or stretched)</li> <li>• Safety belt buckle and tongue assembly</li> <li>• Safety belt retractor</li> </ul>	<ul style="list-style-type: none"> <li>• Bare, broken or disconnected wire</li> <li>• Connector not tightly engaged</li> <li>• Safety belt warning indicator burned out or broken</li> </ul>

3. If the inspection reveals an obvious concern(s) that can be readily identified, service as required. With the exception of removing a twist from the safety belt webbing, do not attempt to repair a component of the safety belt system; new components must be installed.
4. If the concern remains after the inspection, determine the symptom. GO to [Symptom Chart](#) .

5. To check the active restraint system for correct operation, carry out the appropriate Functional Test procedure(s). Refer to Component Test in this section.

## Symptom Chart

Symptom Chart

## Component Test

**⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:**

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

Carry out the appropriate Functional Test procedure(s) as determined in Inspection and Verification.

## Functional Test - Safety Belt Buckle and Tongue

The safety belt buckle and tongue assembly must operate freely during the latching and unlatching function. Fasten the safety belt by inserting the tongue (male portion) into the buckle (female portion).

1. Verify the following during the latching sequence:
  - Tongue insertion is not hindered by excessive effort.
  - A click is heard when the safety belt buckle latches the tongue.
2. Verify the system integrity by forcefully pulling on the safety belt webbing.
3. Unlatch the safety belt by fully depressing the safety belt buckle release button and allowing the safety belt to release and retract.
4. Verify the following during the unlatching process:
  - Push-button depression does not require excessive effort.

- The tongue can be removed easily from the buckle.
5. Repeat the above steps 3 times.
  6. If the functional test reveals a concern(s), install a new safety belt buckle or safety belt retractor as required.

### **Functional Test - Safety Belt Retractor**

The safety belt retractor must be freely operational for extraction and retraction of the safety belt webbing between full extension and in-vehicle stowed positions.

1. Extract and retract the safety belt between the full extension and stowed positions.
2. Verify the safety belt retractor operates without excessive effort or binding.
3. Install a new safety belt retractor if any concern is found or the complaint has been verified.

### **Functional Test - Safety Belt Retractor, Automatic Locking Retractor (ALR) Mode**

1. Position the seat backrest fully upright (if adjustable).
2. Position the safety belt shoulder height adjuster (if equipped) in the full down or up position.
3. Fasten the safety belt.
4. Pull out the safety belt webbing until the Automatic Locking Retractor (ALR) feature is activated.
5. Allow the safety belt webbing to retract until it stops.
6. Pull on the safety belt webbing to check that the safety belt retractor has remained in the ALR mode.  
If the safety belt retractor is not locked, install a new safety belt retractor.
7. Unfasten the safety belt and allow the safety belt webbing to retract to its stowed position.
8. Pull out and retract the safety belt webbing to verify the safety belt retractor has converted automatically out of ALR mode. If the safety belt retractor remains locked in the ALR mode, install a new safety belt retractor.

### **Functional Test - Safety Belt Retractor, Road Test Inspection**

**⚠ WARNING: The driver and passenger must be prepared to brace themselves in the event the safety belt retractor does not lock. Failure to follow this instruction may result in serious personal injury.**

**NOTE:** Make sure there is no excessive slack in the safety belt webbing across the torso during testing.

**NOTE:** Do not jerk on the safety belt webbing when carrying out this test.


1. Test the safety belts in the following sequence:
  1. Fasten the safety belts and proceed to a safe area.
  2. Attain a speed of 24 km/h (15 mph).

3. **⚠ WARNING: Apply maximum brake force only on dry concrete or equivalent hard surface, NEVER on wet pavement or gravel. Failure to follow this instruction may result in serious personal injury.**

Grasp the shoulder harness, lean forward and apply the brakes, making a maximum braking application without a skid.

4. The safety belts should lock up with minimum webbing extension.
  5. If there is a lockup of all safety belt retractors being tested, the safety belt retractors are functioning correctly. If any safety belt retractor fails to lock up, install a new safety belt retractor(s).
-

### Safety Belt Cleaning

1.  **WARNING: Do not bleach or re-dye the safety belt webbing, as the webbing may weaken. Failure to follow this instruction may increase the risk of serious personal injury or death in a crash.**

Clean the safety belt webbing only with a mild soap solution recommended for cleaning upholstery or carpets. Follow the instructions provided with the soap.

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## Safety Belt Maintenance

**⚠ WARNING: After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:**

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

1. The safety belt assemblies should be periodically inspected to make sure that they have not become damaged and that they remain in correct operating condition, particularly if they have been subjected to severe stress.
  2. Before installing the new safety belt assembly, the safety belt retaining areas must be inspected for damage and distortion. If the retaining points are damaged and distorted, the sheet metal must be reworked back to its original shape and structural integrity.
  3. Install the new safety belt(s) using the appropriate instructions. Carry out the appropriate Functional Test Procedure. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System , Component Test, in this section.
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**Safety Belt Procedure After a Collision**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

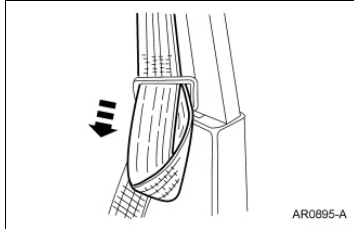
1. Before installing a new safety belt assembly, the safety belt attaching areas must be inspected for damage and distortion. If the attaching points are damaged and distorted, the sheet metal must be worked back to its original shape and structural integrity.
  2. Install the new safety belt(s). For additional information, refer to the appropriate procedure in this section. Carry out all applicable Functional Tests for the component(s). For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-



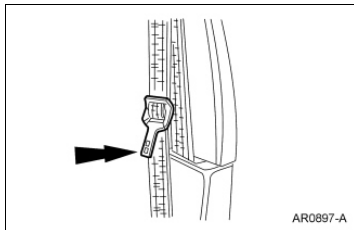


### Safety Belt Tongue Rotated on Belt

1. Grasp the belt tongue and pull the belt webbing down to form a loop through the slot in the tongue.



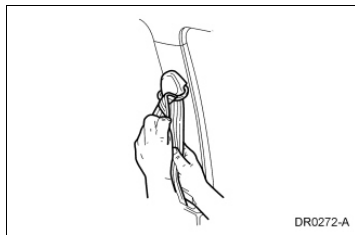
2. Rotate and fold the belt webbing over itself within the slot to remove the twist.
3. Pull the excess belt webbing back through the slot in the belt tongue.
4. Pull the excess belt webbing through the slot.
5. The safety belt tongue should face inward when completed.

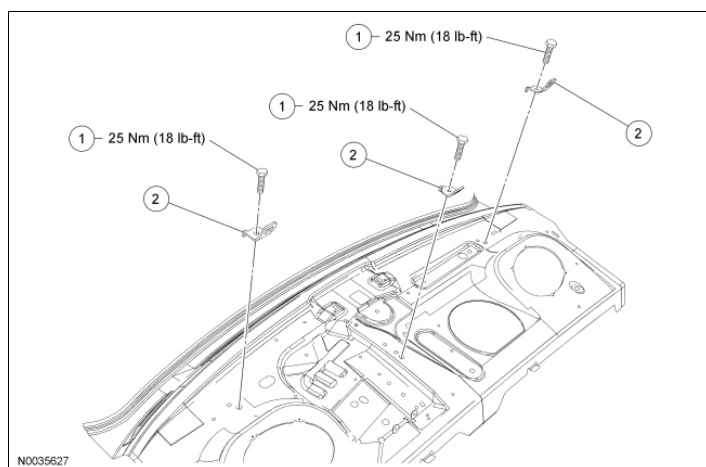


### **Safety Belt Twisted at the Safety Belt Guide**

**NOTE:** Typical D-ring shown, others similar.

1. Grasp the belt webbing at the shoulder belt guide (D-ring).
2. Rotate and fold the belt webbing over itself to remove the twist.
3. Feed the folded portion of the belt through the safety belt guide (D-ring).



**Child Safety Seat Tether Anchor**

Item	Part Number	Description
1	W506423	Child safety seat tether anchor bolts
2	613D74	Child safety seat tether anchors

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.

For police vehicles equipped with fire suppression, depower the fire suppression system.

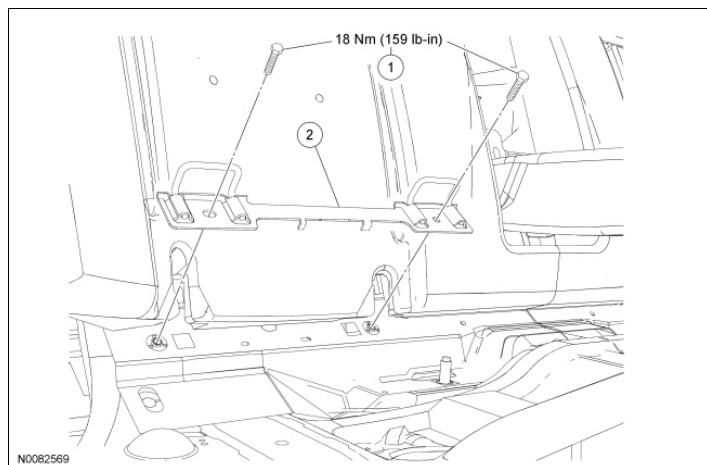
2. Remove the parcel shelf. For additional information, refer to [Section 501-05](#) .
3. Remove the bolt and child safety seat tether anchor.
  - To install, tighten to 25 Nm (18 lb-ft).
4. **⚠ WARNING: Always tighten the child safety seat tether anchor/bolt to specification. Failure to follow this instruction may result in the child's safety seat being incorrectly secured, which increases the risk of serious personal injury or death to the child in a sudden stop or crash.**

To install, reverse the removal procedure.

5. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

For police vehicles equipped with fire suppression, repower the fire suppression system.

6. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in [Safety Belt System](#) in this section.
-

**Child Safety Seat Tether Anchor - LATCH****NOTE:** RH shown, LH similar.

Item	Part Number	Description
1	W707079	Lower anchors and tethers for children bolts (2 required)
2	601B28	Lower anchors and tethers for children

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

**NOTE:** No attempt should be made to repair the lower anchors and tethers for children. Install a new part if damage is verified.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

For police vehicles equipped with fire suppression, depower the fire suppression system.

2. Remove the rear seat cushion. For additional information, refer to Section 501-10 .
3. **⚠ WARNING:** Always tighten the child safety seat tether anchor/bolt to specification. Failure to follow this instruction may result in the child's safety seat being incorrectly secured, which increases the risk of serious personal injury or death to the child in a sudden stop or crash.

Remove the 2 bolts and slide the lower anchors and tethers for children out through the opening in the carpet.

- To install, tighten to 18 Nm (159 lb-in).
  - For installation, make sure the lower anchors and tethers for children is accessible and the alignment tabs are inserted into the slots in the floor pan sheet metal with the wire attachments at the top.
4. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

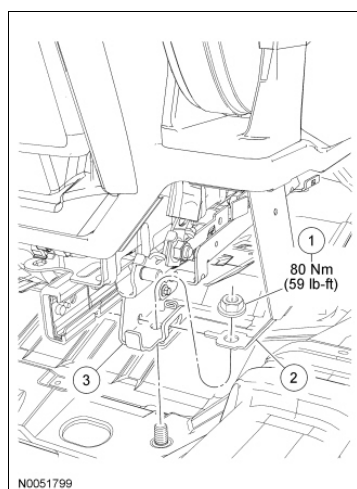
5. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

For police vehicles equipped with fire suppression, repower the fire suppression system.

6. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-





**Safety Belt Buckle - Front, Center**

Item	Part Number	Description
1	N621945	Seat track-to-floor nut, inboard
2	611B76	Center safety belt
3	-	Seat track

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

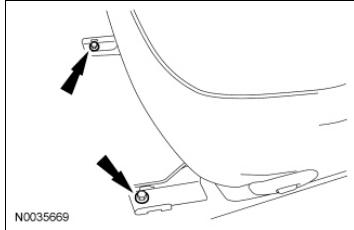
- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

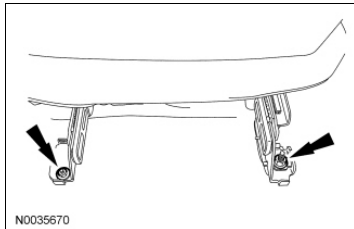
After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

**NOTE:** The front center safety belt and tongue is mounted on the driver seat inboard rear mounting stud. Removal of the center safety belt buckle on the passenger front seat is similar. The front center safety belt and tongue is shown.

1. Position the seat to access the fasteners.
2. Remove the 2 seat track front covers.
3. Remove the 2 seat track-to-floor bolts.
  - To install, tighten to 25 Nm (18 lb-ft).



4. Remove the 2 seat track rear covers.
5. Remove the 2 seat track-to-floor nuts.
  - To install the inboard nut, tighten to 80 Nm (59 lb-ft).
  - To install the outboard nut, tighten to 25 Nm (18 lb-ft).

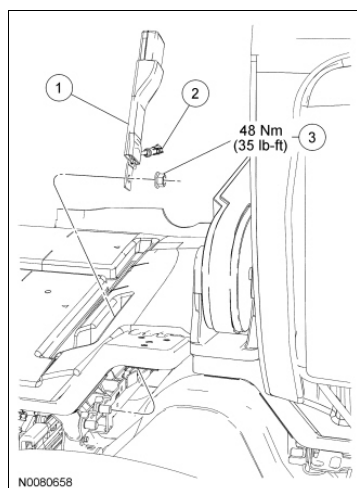


6. Tilt the seat forward enough to separate the front center safety belt and tongue anchor from the mounting stud and seat.
  - For installation, make sure the safety belt anchor is in place on the rear inboard stud before tightening the nut.
7. Route the safety belt and tongue through the seat cushion opening and remove the assembly.
8. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belt and buckles are accessible to the occupants.

To install, reverse the removal procedure.

9. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.



**Safety Belt Buckle - Front****NOTE:** LH shown, RH similar.**NOTE:** Seat backrest and armrest removed for clarity.

Item	Part Number	Description
1	61202 RH/ 61203 LH	Front safety belt buckle
2	-	Electrical connector
3	-	Front safety belt buckle nut

**Removal**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

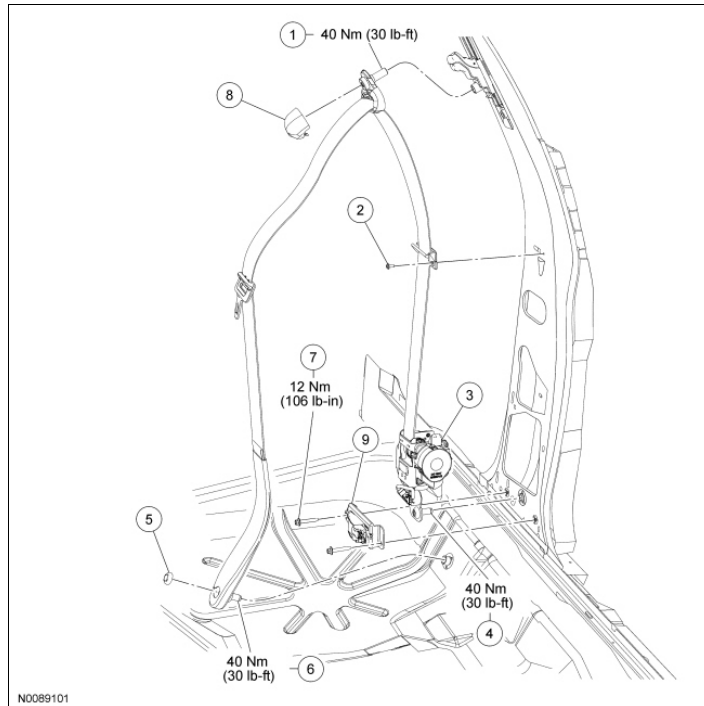
1. **⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.**

Turn the ignition OFF and wait one minute to deplete the backup power supply.

2. Looking under the front seat from the second row, position the affected safety belt buckle nut in the indentation of the transmission tunnel. If equipped with power seats, position the seat all the way up.
3. Position the other seat all the way forward.
4. Disconnect the electrical connector.
5. Remove the nut and front safety belt buckle.
  - Route the front safety belt buckle out from the seat cushion opening.
  - To install, tighten to 48 Nm (35 lb-ft).
6. **NOTE:** Before installation, make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

7. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-

**Safety Belt Retractor and Pretensioner****NOTE:** LH shown, RH similar.

Item	Part Number	Description
1	-	D-ring bolt (part of 611B08 RH/ 611B09 LH)
2	W710123	Secondary safety belt guide screw
3	611B08 RH/ 611B09 LH	Safety belt retractor and pretensioner
4	-	Safety belt retractor and pretensioner bolt (part of 611B08 RH/611B09 LH)
5	611B32	Safety belt anchor cover
6	-	Safety belt anchor bolt (part of 611B08 RH/ 611B09 LH)
7	W707935	Side impact sensor bolt (part of 14B345) (2 required)
8	60262	D-ring cover
9	14B345	Side impact sensor

**Removal**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)

- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners or adaptive load limiting retractors or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners or adaptive load limiting retractors which increases the risk of serious personal injury or death.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition switch is ON.

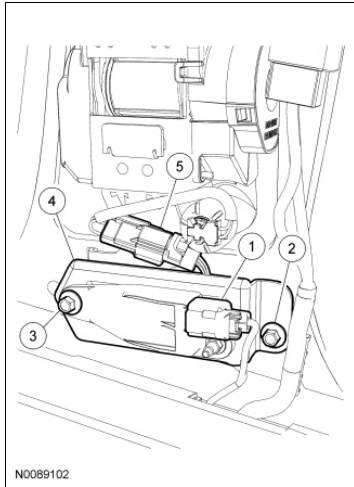
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .
2. **NOTE:** Inspect the D-ring cover for damage. If the cover is damaged or does not remain closed, install a new D-ring cover.  
  
Release the 2 tabs and open the D-ring cover.
3. Remove the bolt and D-ring.
4. Remove the safety belt anchor bolt cover.
5. Remove the bolt and safety belt anchor.
6. Remove the upper and lower B-pillar trim panels. For additional information, refer to Section 501-05 .
7. Remove the secondary safety belt guide screw.
8. **NOTE:** The side impact sensor bolts must be removed in the sequence shown.

Disconnect the electrical connectors and remove the side impact sensor.

1. Disconnect the electrical connector.
2. Remove the bolt.

3. Remove the bolt.
4. Remove the side impact sensor.
5. Disconnect the pretensioner electrical connector.



9. Remove the bolt and safety belt retractor and pretensioner assembly.

## Installation

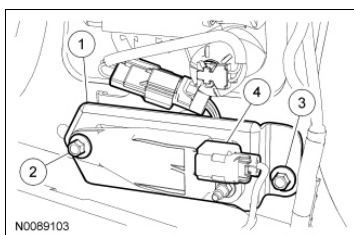
**NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

1. Install the safety belt retractor and pretensioner and bolt.
  - Tighten to 40 Nm (30 lb-ft).
2. Connect the pretensioner electrical connector.
3. **⚠ WARNING:** Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.

**NOTE:** The side impact sensor bolts must be installed in the sequence shown.

Install the side impact sensor with bracket.

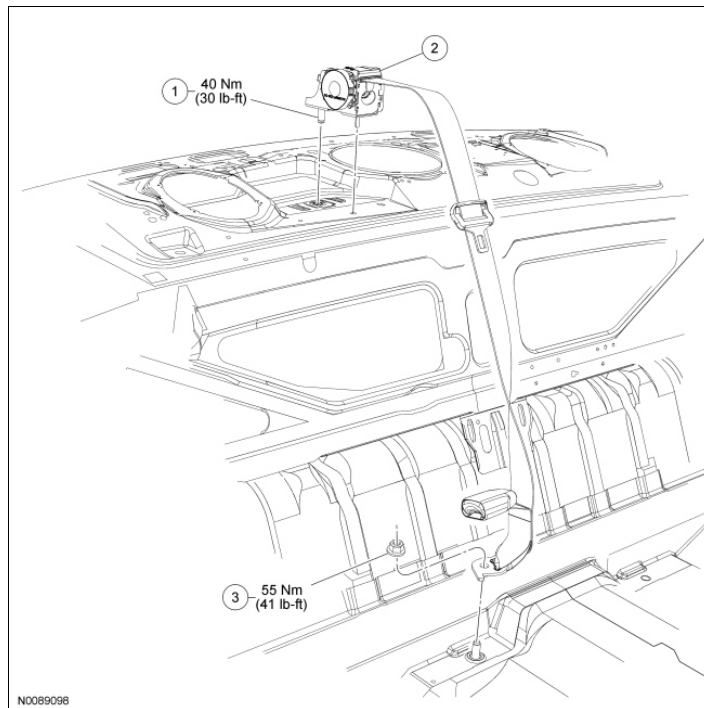
1. Position the side impact sensor with bracket.
2. Install the bolt.
  - ◆ Tighten to 12 Nm (106 lb-in).
3. Install the bolt.
  - ◆ Tighten to 12 Nm (106 lb-in).
4. Connect the electrical connector.



4. Install the secondary safety belt guide screw.



5. Install the upper and lower B-pillar trim panels. For additional information, refer to Section 501-05 .
  6. Install the safety belt anchor and bolt.
    - Tighten to 40 Nm (30 lb-ft).
  7. Install the safety belt anchor bolt cover.
  8. Install the D-ring and bolt.
    - Tighten to 40 Nm (30 lb-ft).
  9. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B .
  10. Check the active restraint system for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-

**Safety Belt Retractor - Rear, Center**

Item	Part Number	Description
1	-	Safety belt retractor bolt (part of 600A38)
2	600A38	Safety belt retractor
3	N800937	Safety belt anchor nut

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious

personal injury or death in a crash.

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

For police vehicles equipped with fire suppression, depower the fire suppression system.

2. Remove the rear seat (cushion and backrest). For additional information, refer to Section 501-10 .
3. Disengage the safety belt from the bezel and remove the parcel shelf. For additional information, refer to Section 501-05 .
4. Remove the nut and safety belt anchor.
  - To install, tighten to 55 Nm (41 lb-ft).
5. Remove the bolt and safety belt retractor.
  - To install, tighten to 40 Nm (30 lb-ft).
  - For installation, engage the safety belt retractor anti-rotation tab to the package tray sheet metal.
6. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

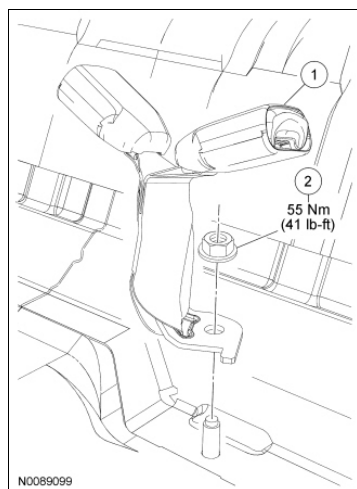
To install, reverse the removal procedure

7. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

For police vehicles equipped with fire suppression, repower the fire suppression system.

8. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-



**Safety Belt Buckle - Rear**

Item	Part Number	Description
1	60044	Safety belt buckle assembly
2	N800937	Safety belt buckle nut

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

**NOTE:** The RH safety belt buckle is a part of the rear center safety belt retractor assembly. For additional information, refer to Safety Belt Retractor - Rear, Center in this section.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.

For police vehicles equipped with fire suppression, depower the fire suppression system.

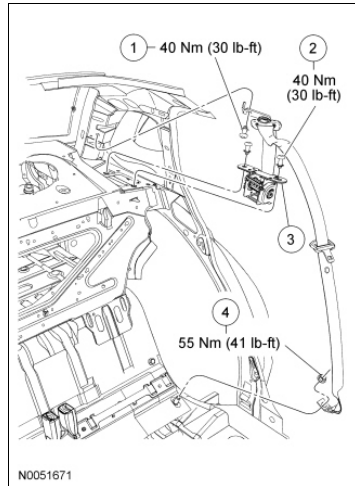
2. Remove the rear seat cushion. For additional information, refer to Section 501-10 .
3. Remove the nut and safety belt buckle assembly.
  - To install, tighten to 55 Nm (41 lb-ft).
4. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

5. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

For police vehicles equipped with fire suppression, repower the fire suppression system.

6. Check the active restraint system for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-

**Safety Belt Retractor - Rear****NOTE:** LH shown, RH similar.**NOTE:** Rear seat backrest is removed for clarity.

Item	Part Number	Description
1	-	Bolt, safety belt guide (part of 611B68 RH/611B69 LH)
2	-	Bolt, safety belt retractor (part of 611B68 RH/611B69 LH) (2 required)
3	611B68 RH/ 611B69 LH	Safety belt retractor
4	N800937	Rear seat backrest nut

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt

pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

For police vehicles equipped with fire suppression, depower the fire suppression system.

2. Remove the parcel shelf. For additional information, refer to Section 501-05 .
3. Remove the 2 safety belt retractor bolts.
  - To install, tighten to 40 Nm (30 lb-ft).
4. Remove the bolt and safety belt guide.
  - To install, tighten to 40 Nm (30 lb-ft).
5. Remove the rear seat backrest nut and safety belt anchor.
  - To install, tighten to 55 Nm (41 lb-ft).
6. Remove the safety belt retractor.
7. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

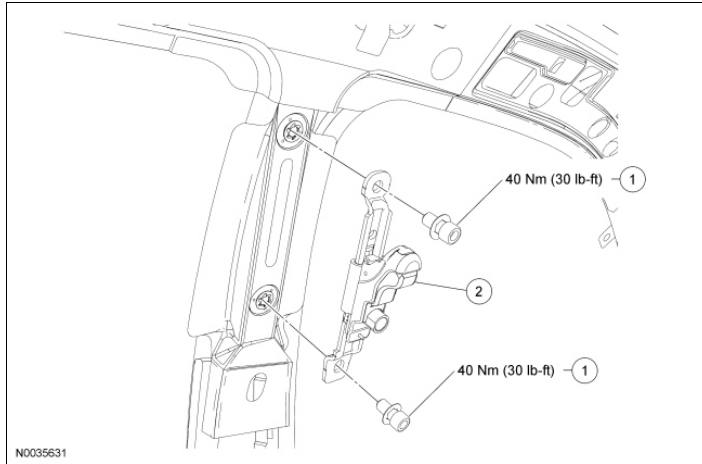
8. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

For police vehicles equipped with fire suppression, repower the fire suppression system.

9. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-





**Safety Belt Shoulder Height Adjuster****NOTE:** LH shown, RH similar.

Item	Part Number	Description
1	-	Safety belt shoulder height adjuster bolts (part of 602B82) (2 required)
2	602B82	Safety belt shoulder height adjuster

**Removal and Installation**

**⚠ WARNING:** After any crash, all of the following safety belt assemblies and attaching hardware must be inspected by an authorized dealer to verify correct function:

- ◆ Retractors
- ◆ Buckles
- ◆ Belt tension sensor (BTS) (if equipped)
- ◆ Front safety belt buckle support assemblies (slide bar) (if equipped)
- ◆ Safety belt shoulder belt height adjusters (if equipped)
- ◆ Child safety seat tether bracket assemblies
- ◆ Automatic locking retractor (ALR) feature for child safety seats (passenger seating positions only)

If any safety belt assembly is damaged, does not operate correctly or does not pass all of the Functional Tests in the Diagnosis and Testing portion of this section, a new safety belt assembly must be installed. If any safety belt assembly attaching areas are damaged or distorted, the sheet metal must be restored to its original structural integrity and new safety belt assembly and attaching hardware must be installed. Failure to install new safety belt assemblies and attaching hardware may increase the risk of serious personal injury or death in a crash.

After any crash that results in deployment of the driver and/or front outboard passenger safety belt pretensioners, new driver and/or front outboard passenger safety belt systems (including retractors, buckles and height adjusters) must be installed. Failure to install new safety belt systems increases the risk of serious personal injury or death in a crash.

1. Remove the upper B-pillar trim panel. For additional information, refer to [Section 501-05](#) .

2. Remove the 2 bolts and safety belt shoulder height adjuster.
  - To install, tighten to 40 Nm (30 lb-ft).
3. **NOTE:** Make sure the safety belt webbing is not twisted and the safety belts and buckles are accessible to the occupants.

To install, reverse the removal procedure.

4. Check the active restraints for correct operation. For additional information, refer to the appropriate Functional Test procedure in Safety Belt System in this section.
-

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Front impact severity sensor bolts	12	106
Passenger air bag module bolts (through glove compartment opening)	9	80
Passenger air bag module bolts (under trim panel)	3	27
Restraints Control Module (RCM) bolts	12	106
Seat position sensor bolt	9	80
Seat position sensor magnet assembly bolt	9	80
Side air bag module nuts	7	62
Side impact sensor bolts	12	106

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## SECTION 501-20B: Supplemental Restraint System

2010 Crown Victoria, Grand Marquis  
Workshop Manual

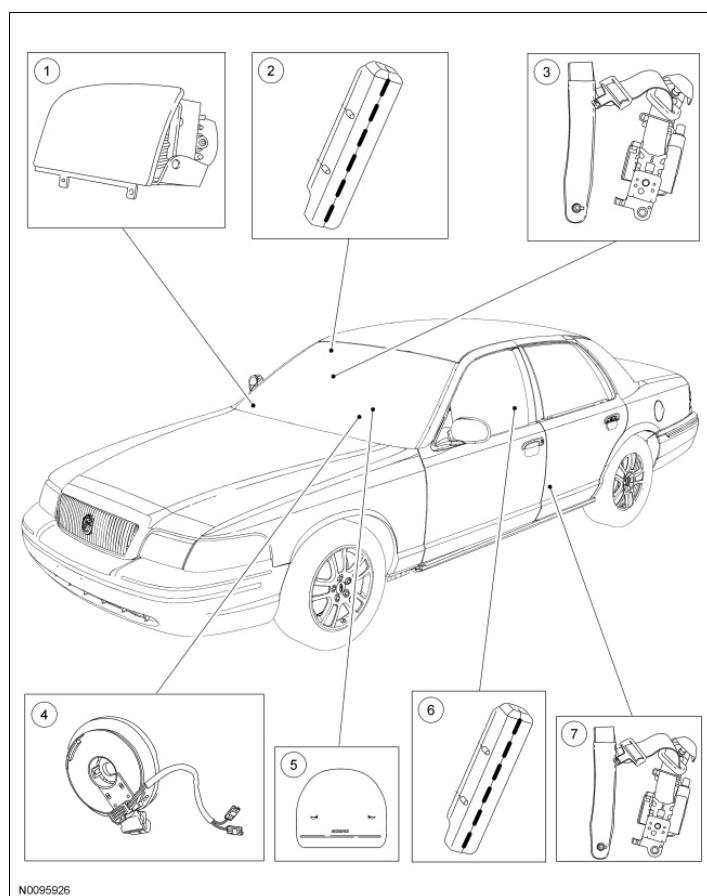
## DESCRIPTION AND OPERATION

Procedure revision date: 08/19/2009

**Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)**

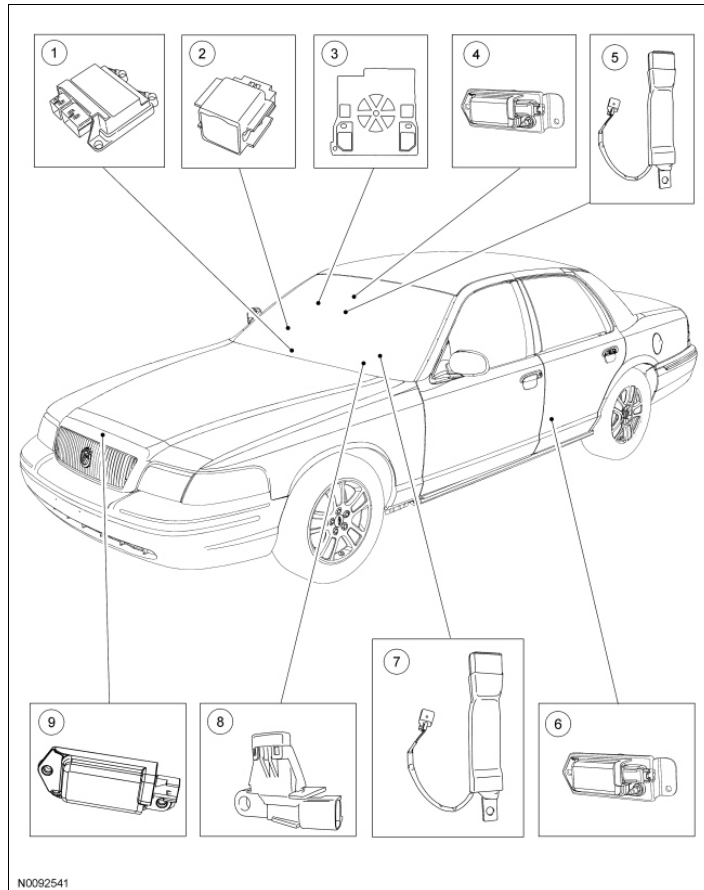
The Supplemental Restraint System (SRS) is designed to provide increased collision protection for front seat occupants in addition to that provided by the 3-point safety belt system. Safety belt use is necessary to obtain the best occupant protection and to receive the full advantage of the SRS .

The serviceable air bag and safety belt pretensioner SRS components are shown in the following illustrations.

**Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) Deployable Components**

Item	Part Number	Description
1	044A74	Passenger air bag module
2	611D10	Passenger seat side air bag module
3	611B08	Passenger safety belt retractor pretensioner
4	14A664	Clockspring
5	043B13	Driver air bag module
6	611D11	Driver seat side air bag module
7	611B09	Driver safety belt retractor pretensioner

# Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) Sensor Components

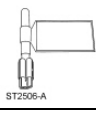
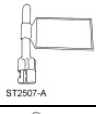
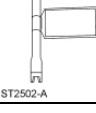





Item	Part Number	Description
1	14B321	Restraints Control Module (RCM)
2	14B418	Passenger Air Bag Deactivation (PAD) indicator
3	14B422	Occupant Classification System (OCS) System
4	14B345	Passenger side impact sensor
5	61202	Passenger seat safety belt buckle with usage detection switch and belt tension sensor
6	14B345	Driver side impact sensor
7	61202	Driver seat safety belt buckle with usage detection switch
8	14B416	Seat position sensor
9	14B006	Front impact severity sensor (2 required)



**Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)**

## Special Tool(s)

	Diagnostic Tool, Restraint System (1 required) 418-F088 (105-R0012 or 105-R0013)
	Diagnostic Tool, Restraint System (2 required) 418-133
	Diagnostic Tool, Restraint System (4 required) 418-F395
	Flex Probe Kit 300-NUD105-R025DE or equivalent
	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
	Vehicle Communication Module (VCM) and Integrated Diagnostic system (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation**

Supplemental Restraint System (SRS) consists of a driver and passenger dual stage air bag module (containing an inflator/squib, gas generator and an air bag), safety belt pretensioners (containing an inflator/squib gas generator), impact sensors, a Restraints Control Module (RCM), a clockspring, an air bag warning indicator, Occupant Classification System (OCS) system and a Passenger Air Bag Deactivation (PAD) indicator. These components are all interconnected by a wiring harness and powered by the vehicle's battery. The RCM includes a backup power supply. This feature provides sufficient backup power to deploy the SRS components in the event that the ignition circuit is lost or damaged during impact. The backup power supply will deplete its stored energy approximately one minute after power and/or ground has been removed from the RCM. If a SRS fault exists, the RCM supplies a ground to flash a coded sequence which is called a Lamp Fault Code (LFC) on the air bag warning indicator located in the Instrument Cluster (IC) module. Each LFC is flashed 3 times after which the air bag indicator will remain lit for the remainder of the key-on cycle. In addition to the self-test at start up, the RCM continuously monitors all of its external and internal circuitry for faults.

In a frontal collision, the impact sensor located in the front of the vehicle detects sudden deceleration and sends an electrical signal to the RCM. The RCM uses the information from the impact sensor in the deployment determination. If the RCM determines that deployment is required, the RCM sends voltage and current to the squib(s) causing the solid chemical propellant to undergo a rapid chemical reaction. This controlled reaction produces harmless nitrogen gas that fills the air bag(s) and/or activates the safety belt pretensioners to remove slack from the safety belt(s).



The RCM communicates through the Data Link Connector (DLC) the current and historical DTCs.

### Air Bag Warning Indicator

The air bag warning indicator:

- is located in the IC module.
- prove out is a function of the RCM . The RCM will prove out the air bag warning indicator by illuminating it for 6 seconds and then turn off.
- will flash/illuminate based on the SRS fault.
- will illuminate continuously if the RCM is disconnected.

### Air Bag Module Second Stage Deployment

Because the driver and passenger front air bags each have 2 deployment stages, it is possible that Stage 1 has deployed and the Stage 2 has not.

If a front air bag module has deployed, it is **mandatory** that the front air bag module be remotely deployed using the appropriate air bag disposal procedure to make sure that the second stage has been deployed.

- For information on driver air bag module and/or passenger air bag module remote deployment, refer to Pyrotechnic Device Disposal in this section.

### Clockspring

The clockspring:

- is mounted on the steering column, behind the steering wheel.
- allows for continuous electrical connections between the driver air bag module and the RCM when the steering wheel is turned.

### Driver Air Bag Module

The driver air bag module:

- is a dual-stage air bag, deploying at 1 of 2 different rates depending upon impact severity.
- is installed as an assembly.
- is mounted in the center of the steering wheel.

### Impact Sensors

**⚠ WARNING: If a vehicle has been in a crash, inspect the restraints control module (RCM) and the impact sensor (if equipped) mounting areas for deformation. If damaged, restore the mounting areas to the original production configuration. A new RCM and sensors must be installed whether or not the air bags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.**

The SRS employs 5 impact sensors. One of the sensors is integral to the RCM and is not separately serviceable. The RCM is mounted on the center tunnel under the instrument panel. There are 2 front impact

severity sensors located in the front-center of the vehicle, behind the grille. In addition, there are 2 side impact sensors. The side impact sensors are located at the base of each B-pillar below the safety belt retractor and pretensioner. Mounting orientation is critical for correct operation of all impact sensors.

## Loops/Squibs

All deployable devices contain an initiating device called a squib. The squib is part of the deployment loop. Air bag/safety canopy modules can contain more than one squib, some vehicles may have up to 4 squibs in one air bag module. Squibs are often referred to as loops during the diagnostic process.

## Occupant Classification System (OCS) System

**NOTICE:** It is necessary to carry out the Occupant Classification System (OCS) system reset when a front passenger seat cushion is disassembled, a new trim is cover installed or an OCS system service kit is installed. A scan tool is used to carry out the OCS system reset. Failure to follow these instructions may result in incorrect operation of the OCS system and may cause system failure.

**NOTICE:** Make sure the seat is completely assembled to prevent system failure before carrying out the Occupant Classification System (OCS) system reset.

**NOTE:** To identify between a production OCS system and an OCS service kit, inspect the OCSM electrical connector.

A production OCS system allows the disconnection of the OCSM electrical connector. An OCS system service kit has the OCSM electrical connector glued to the module, it cannot and should not be disconnected or altered. An OCS system service kit also has an in-line connector between the OCSM and the seat wiring harness.

The seat OCS system is found only on the front passenger seat. The front passenger seat OCS system is comprised of a silicone gel-filled bladder mounted in the seat cushion, a pressure sensor that is mounted to the seat frame and an OCSM which is also mounted to the seat frame. Pressure is applied to the OCS system bladder when weight of any occupant or object in the front passenger seat is present. The pressure is then transferred through a tube, is sensed by the OCS system pressure sensor, then electronically communicated to the OCSM . Based on preprogrammed set points, the OCSM will inform the Restraints Control Module (RCM), via a dedicated High Speed Controller Area Network (HS-CAN), of the necessary information. The RCM uses this information in determining if the passenger air bag module is to be deployed in the event of a deployable collision. The RCM may also use this information to illuminate/not illuminate the Passenger Air Bag Deactivation (PAD) indicator. For information regarding PAD indicator operation, refer to Passenger Air Bag Deactivation (PAD) Indicator in this section.

The OCS system components (seat cushion foam pad, bladder with pressure sensor and OCSM ) are calibrated to each other and are serviced as an assembly. **OCS system components are not to be installed separately.**

The OCS system also interprets a variable voltage signal provided by the Belt Tension Sensor (BTS) to identify the presence of a correctly fastened child safety seat in the front passenger seat. The OCSM then communicates with the RCM , automatically deactivating the passenger air bag module. Refer to BTS in this section.

The OCS system is also used for operation of the passenger Belt-Minder®. For information on the passenger Belt-Minder® feature, refer to [Section 501-20A](#) . To deactivate or reactivate the passenger Belt-Minder® feature, refer to [Section 413-01](#) or the Owner's Literature.

### Occupant Classification System Module (OCSM)

Based on programmed limits, the Occupant Classification System Module (OCSM) will inform the Restraints Control Module (RCM), via a dedicated High Speed Controller Area Network (HS-CAN), of the necessary information. The RCM uses this information in determining if the passenger air bag module or passenger seat side air bag module is to be deployed in the event of a deployable collision.

The OCSM monitors the OCS system for faults and communicates on-demand and continuous DTCs to the RCM .

### Passenger Air Bag Deactivation (PAD) Indicator

The Passenger Air Bag Deactivation (PAD) indicator is a visual indicator used to inform the front seat occupants of the passenger air bag deactivation state. The PAD indicator is a stand-alone lamp installed into the vehicle instrument panel in a position visible to each front seat occupant.

The Restraints Control Module (RCM) controls the state of the PAD indicator through a direct hardwire connection, based on information provided by the OCS system. The PAD indicator is lit to indicate the passenger air bag module is disabled. An exemption to this is when the front passenger seat is determined to be empty, and therefore indication of a deactivated passenger air bag module is not necessary. In all other cases, the PAD indicator is unlit when the passenger air bag module is enabled.

The RCM briefly activates the PAD indicator to prove-out the indicator function and verify to the front occupants correct functional operation of the PAD indicator.

The following table indicates the passenger air bag status and the PAD indicator status based the size of the front outboard passenger occupant.

#### Passenger Air Bag Deactivation (PAD) Indicator Status

Occupant Size	Passenger Safety Belt Buckle Status	Passenger Air Bag Status	PAD Indicator Status
None	Unbuckled	Disabled	Unlit
None	Buckled	Disabled	Lit
Small	Buckled/ Unbuckled	Disabled	Lit
Large	Buckled/ Unbuckled	Enabled	Unlit

### Safety Belt Tension Sensor (BTS)

The safety BTS :

- is part of the front outboard passenger safety belt buckle assembly.
- is located on the front passenger seat track safety belt buckle mounting bracket.
- is used in conjunction with the OCS system.
- is a 3-wire Hall-effect sensor that is incorporated into the mounting anchor of the front outboard passenger safety belt buckle assembly.

The BTS is used by the Occupant Classification System (OCS) system to identify the presence of a child safety seat on the front outboard passenger seat, when the child safety seat is installed according to manufacturer instructions. The BTS senses the tension on the safety belt assembly then provides an output to the Occupant Classification System Module (OCSM), indicating that the safety belt assembly is cinched. After sensing the weight applied to the seat by the occupant and using the BTS input, the OCS system determines how the occupant should be classified and communicates this information to the Restraints Control Module (RCM). If the occupant is classified to be a child, the RCM will then automatically deactivate the passenger air bag module and turn the Passenger Air Bag Deactivation (PAD) indicator on. Refer to Passenger Air Bag Deactivation (PAD) Indicator in this section for the indicator status and operation.

### Passenger Air Bag Module

The passenger air bag module:

- is a dual-stage air bag, deploying at 1 of 2 different rates depending upon impact severity.
- is installed as an assembly.
- is mounted in the passenger side of the instrument panel.

### Restraints Control Module (RCM)

**⚠ WARNING: If a vehicle has been in a crash, inspect the restraints control module (RCM) and the impact sensor (if equipped) mounting areas for deformation. If damaged, restore the mounting areas to the original production configuration. A new RCM and sensors must be installed whether or not the air bags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.**

**⚠ WARNING: Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.**

#### **The RCM carries out the following functions:**

- Signals the inflators to deploy the air bags in the event of a deployable crash.
- Activates the safety belt retractor pretensioners to remove slack from the safety belt.
- Monitors the air bag Supplemental Restraint System (SRS) for faults.
- Illuminates the air bag warning indicator if a fault is detected.
- Receives information from the front and side impact sensors.
- Sends safety belt buckle status to the Instrument Cluster (IC) module for safety belt indicator and Belt-Minder®.
- Flashes the air bag warning indicator to indicate the Lamp Fault Code (LFC) detected.
- Communicates with the Occupant Classification System Module (OCSM) on a dedicated High Speed Controller Area Network (HS-CAN).
- Signals the Lighting Control Module (LCM) module to activate a chime if a fault is detected.
- Communicates through the Data Link Connector (DLC) the current or historical DTCs.
- Contains an internal sensor which is not serviced separately.

The RCM monitors the SRS for possible faults. If a fault is detected, the RCM will illuminate the air bag warning indicator located in the IC and signal the LCM to activate the chime.

The chime is a series of 5 sets of 5-tone bursts. If the chime is heard and/or the air bag warning indicator is illuminated, the SRS and the air bag warning indicator require repair. When the ignition is cycled (turned off and then on), the air bag warning indicator will remain lit for 6 seconds and then go out. If a SRS fault exists, the air bag warning indicator will then flash the 2-digit LFC. The air bag warning indicator will flash the LFC

5 times, then it will remain illuminated for the rest of the ignition cycle. The RCM will also communicate the current and historical DTCs through the DLC , using the scan tool.

LFCs are prioritized. If 2 or more faults occur at the same time, the fault having the highest priority will be displayed first. After that fault has been corrected, the next highest priority fault will be displayed.

The RCM includes a backup power supply. This feature provides sufficient backup power to deploy the SRS components in the event that the ignition circuit is damaged in a collision before air bag deployment is activated. The backup power supply will deplete its stored energy approximately one minute after power and/or ground has been removed from the RCM .

### **Safety Belt Buckle Switches**

The safety belt buckle switches are comprised of integrated circuits called Hall-effect sensors. The safety belt buckle switches (Hall-effect sensors) are located in the driver and passenger safety belt buckles. Safety belt buckle switches are used to indicate to the RCM whether the safety belts are buckled or unbuckled. The RCM uses this information in determining the deployment of the dual-stage driver and passenger air bag modules.

### **Safety Belt Retractor Pretensioners**

Safety belt retractor pretensioners are pyrotechnic devices integrated to the driver and passenger safety belt retractor assemblies. The safety belt retractor pretensioners work in conjunction with the safety belt buckle pretensioners and control the tension of the driver and passenger safety belts in the event of a deployable collision. The RCM monitors the readiness of the safety belt retractor pretensioners. The RCM uses this information and all other information provided by the restraints system to determine what action is to be taken.

### **Seat Track Position Sensor**

The seat track position sensor is a Hall-effect sensor located on the driver seat track. Based on programmed limits, the seat track position sensor will inform the Restraints Control Module (RCM) of the driver seat position. The RCM uses this information in determining the deployment of the dual-stage driver air bag module.

### **Secondary Air Bag Warning (Chime)**

The secondary air bag warning chime, is an audible chime generated by the Lighting Control Module (LCM). If the Restraints Control Module (RCM) has detected a fault with the air bag warning indicator, a DTC will be stored in the memory of the RCM . Upon the RCM sensing that a Supplemental Restraint System (SRS) fault has been detected, the RCM will signal the LCM to sound the secondary air bag warning chime in a pattern of 5 sets of 5 beeps.

### **Seat Side Air Bag Module**

The driver/passenger seat side air bag module:

- will deploy upon receiving a signal from the Restraints Control Module (RCM) initiated by the driver/passenger side impact sensor.
- is installed as an assembly.

- is mounted in the seat back.

## **Diagnostic Instructions**

The symptom chart can be used to help locate Supplemental Restraint System (SRS) concerns if no DTCs are retrieved and the listed symptoms are observed. Whether or not the listed symptoms are observed, always carry out the following:

1. Retrieve all DTCs stored in the Restraints Control Module (RCM) memory. Refer to Retrieve/Clear Continuous DTCs in this section.
2. Run the On-Demand Self Test to determine what DTCs are currently being sensed by the RCM .
3. If on-demand DTCs are different than continuous memory DTCs, always repair the on-demand DTCs first.

A DTC can indicate several concerns. The DTCs are to assist in system diagnosis and are not to be considered definitive. Always refer to the pinpoint test corresponding to the DTC to determine where the concern lies and to repair the concern correctly.

## **Self Test/Continuous Memory and Clear DTCs**

During vehicle operation, the Restraints Control Module (RCM) will detect and store both intermittent and hard failure DTCs in non-volatile memory. The DTC strategy employed by the RCM incorporates a time-out scheme for determining when a concern exists in the system. This requires a concern to exist for up to one minute in the system before the RCM will detect it.

Once 128 key cycles have been recorded since the concern was last detected, the DTC will automatically be removed from memory.

## **Lamp Fault Code (LFC)**

When the Restraints Control Module (RCM) detects a system fault, it will flash a coded sequence which is called a Lamp Fault Code (LFC) on the air bag warning indicator located in the Instrument Cluster (IC) module. The code is 2 digits. The first digit is flashed with a 0.5-second interval between pulses. There is a 2-second pause before the second digit is flashed, which also has a 0.5-second interval between pulses. There is a 5-second pause between each display of an LFC .

Each LFC is flashed 3 times after which the air bag indicator will remain lit for the remainder of the key-on cycle (except for DTC B2792 [cross link between firing loops] which only flashes one LFC ). If there are multiple LFCs , each LFC will flash in order of priority.

## **Fault PIDs**

There are 2 types of fault PIDs that can be reported by the Restraints Control Module (RCM). The first type, considered conventional, has only one level of fault reporting and identifies a specific concern for a given component and points to a particular diagnostic path, example: DTC B1317 (Battery Voltage High).

The second type uses a process within the software of the controller that maps the byte and bit to name a specific device and fault condition. This process is called Bit-mapping and referred to as fault PIDs in the

diagnosis of the vehicle. This type does not identify the specific concern or component on the first level of fault reporting, example: DTC B2293 (Restraint system - Airbag Fault). DTC B2293 can have up to 28 specific on-demand fault PIDs (areas of concern) associated with this DTC.

Those associated fault PIDs are an extension of the information provided by the DTC and are identified by the same DTC number. A scan tool must be used to view DTCs and their fault PIDs. Once a scan tool has retrieved a DTC, use the scan tool to view the fault PIDs. In the diagnostic path, other types of PIDs are sometimes used to determine the root cause (example: resistance or voltage PIDs).

When viewing of fault PIDs has been carried out, the scan tool can display the PIDs associated with that DTC, including the status or state that exists (on-demand [active] DTC) or existed (continuous memory [historic]) DTC. Refer to the manufacturer instructions for the scan tool being used on how to view fault PIDs.

### **Prove Out Procedure**

Turn the ignition from the OFF to the ON position and monitor the air bag warning indicator with all Supplemental Restraint System (SRS) components connected or restraint system diagnostic tools installed. The air bag warning indicator will light continuously for approximately 6 seconds and then turn off. If an SRS fault is present, the air bag warning indicator will:

- fail to light.
- remain lit continuously.
- flash.

The flashing might not occur until approximately 30 seconds after the ignition has been turned from the OFF to the ON position. This is the time required for the Restraints Control Module (RCM) to complete the testing of the SRS . If the air bag warning indicator is inoperative and an SRS fault exists, a chime will sound in a pattern of 5 sets of 5 beeps. If this occurs, the air bag warning indicator will need to be repaired before diagnosis can continue.

### **Glossary**

#### **Air Bag/Pretensioner Restraint System Diagnostic Tools**

Air bag/pretensioner restraint system diagnostic tools are used to simulate the equivalent resistance of an air bag module or safety belt pretensioner during certain diagnostic procedures.

#### **Deactivate the Supplemental Restraint System (SRS)**

Deactivate the Supplemental Restraint System (SRS) means to carry out a deactivation procedure. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.

#### **Depower the SRS**

Depower the LFC means to disconnect the battery and remove the RCM fuse. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

#### **Reactivate the SRS**

Reactivate the SRS means to carry out the reactivation procedure. Refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.

## Repower the SRS

Repower the SRS means to remove any restraint system diagnostic tools that may have been installed, turn the ignition ON, install the RCM fuse and connect the battery ground cable. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.

## Inspection and Verification

**⚠ WARNING: If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

1. Verify the customer concern by checking the air bag warning indicator in the Instrument Cluster (IC) module. Refer to Prove Out the Supplemental Restraint System (SRS) in this section.
2. Visually inspect for obvious signs of mechanical or electrical damage. Do not disconnect electrical connectors until directed to do so within the pinpoint test.

## Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Damaged Restraints Control Module (RCM) or loose mounting</li> <li>• Damaged front impact severity sensor(s) or loose mounting</li> <li>• Damaged side impact sensor(s) or loose mounting</li> <li>• Damaged or disconnected Passenger Air Bag Deactivation (PAD) indicator</li> <li>• Damaged or loose mounting of a Occupant Classification System (OCS) system component</li> </ul>	<ul style="list-style-type: none"> <li>• Open Central Junction Box (CJB) fuse 22 (10A)</li> <li>• Damaged wiring harness</li> <li>• Loose, damaged or corroded connectors</li> <li>• Circuitry open/shorted</li> <li>• Damaged shorting bars</li> <li>• Loose, damaged or pinched passenger seat wire harness</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .



- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.
6. If the scan tool does not communicate with the vehicle:
    - verify the ignition key is in the ON position.
    - verify the scan tool operation with a known good vehicle.
    - refer to Section 418-00 to diagnose no response from the PCM.
  7. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
    - If the network test passes, retrieve and record on-demand and Continuous Memory Diagnostic Trouble Codes (CMDTCs) from the RCM .
  8. If the DTCs retrieved are related to the concern, GO to the DTC Charts. For all other DTCs, refer to Section 419-10 .
  9. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

The DTCs can be retrieved from the Restraints Control Module (RCM) with a scan tool via the DLC .

### Supplemental Restraint System (SRS) DTC Chart

DTC	Description	Action To Take
-	The Air Bag Warning Indicator is Illuminated Continuously	<u>GO to Pinpoint Test A</u> .
B1231	Crash Data Memory Full	INSTALL a new RCM and impact sensors. REFER to <u>Inspection and Repair After a Supplemental Restraint System (SRS) Deployment</u> in this section.
B1317	Battery Voltage High	<u>GO to Pinpoint Test AC</u> .
B1318	Battery Voltage Low	<u>GO to Pinpoint Test AC</u> .
B1342	ECU Is Faulted	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
B1869	Air Bag Warning Indicator Circuit Open or Short to Ground	<u>GO to Pinpoint Test B</u> .
B1870	Air Bag Warning Indicator Circuit Short to Battery	<u>GO to Pinpoint Test C</u> .
B1884	PAD Warning Lamp Circuit Failure	<u>GO to Pinpoint Test D</u> .
B1890	PAD Warning Lamp Circuit Short to Battery	<u>GO to Pinpoint Test E</u> .
B1891	Air Bag Tone Warning Indicator Circuit Short to Battery	<u>GO to Pinpoint Test F</u> .
B1892	Air Bag Tone Warning Indicator Open Circuit or Short to Ground	<u>GO to Pinpoint Test G</u> .
B1921	Air Bag Diagnostic Monitor Ground Circuit Open	<u>GO to Pinpoint Test H</u> .

B2290	Occupant Classification Sensor System Fault	<u>GO to Pinpoint Test I .</u>
B2292	Restraint System - Seatbelt Pretensioner Fault	<u>GO to Pinpoint Test J .</u>
B2293	Restraint System - Air Bag Fault	<u>GO to Pinpoint Test K .</u>
B2295	Restraint System - Side Airbag Fault	<u>GO to Pinpoint Test L .</u>
B2296	Restraint System - Impact Sensor Fault	<u>GO to Pinpoint Test M .</u>
B2432	Drivers Seat Belt Buckle Switch Circuit Open	<u>GO to Pinpoint Test N .</u>
B2433	Drivers Seat Belt Buckle Switch Circuit Short to Battery	<u>GO to Pinpoint Test O .</u>
B2434	Drivers Seat Belt Buckle Switch Circuit Short to Ground	<u>GO to Pinpoint Test P .</u>
B2435	Drivers Seat Belt Buckle Switch Circuit Resistance Out of Range	<u>GO to Pinpoint Test Q .</u>
B2436	Passengers Seat Belt Buckle Switch Circuit Open	<u>GO to Pinpoint Test R .</u>
B2437	Passengers Seat Belt Buckle Switch Circuit Short to Battery	<u>GO to Pinpoint Test S .</u>
B2438	Passengers Seat Belt Buckle Switch Circuit Short to Ground	<u>GO to Pinpoint Test T .</u>
B2439	Passengers Seat Belt Buckle Switch Circuit Resistance Out of Range	<u>GO to Pinpoint Test U .</u>
B2477	Module Configuration Error	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
B2792	Cross Link Between Firing Loops	<u>GO to Pinpoint Test V .</u>
B2909	Belt Tension Sensor Fault	<u>GO to Pinpoint Test W .</u>
C1414	Incorrect Module Design Level	<u>GO to Pinpoint Test X .</u>
C1946	Front Driver's Seat Track Position Switch Circuit Open	<u>GO to Pinpoint Test Y .</u>
C1947	Front Driver's Seat Track Position Switch Circuit Short to Ground	<u>GO to Pinpoint Test Z .</u>
C1948	Front Driver's Seat Track Position Switch Circuit Resistance Out of Range	<u>GO to Pinpoint Test AA .</u>
C1982	Front Driver's Seat Track Position Switch Circuit Short to Battery	<u>GO to Pinpoint Test AB .</u>

**Supplemental Restraint System (SRS) Lamp Fault Code (LFC) Chart**

<b>Lamp Fault Code (LFC) <sup>a</sup></b>	<b>LFC Priority</b>	<b>Description</b>	<b>Action To Take</b>
NONE	1	Air Bag Warning Indicator Circuit Short to Battery	<u>GO to Pinpoint Test C .</u>

NONE Continuous Lamp	1	Air Bag Warning Indicator Circuit Open or Short to Ground	<u>GO to Pinpoint Test B .</u>
Continuous	2	The Air Bag Warning Indicator is Illuminated Continuously - RCM Disconnected or Inoperative, Loss of Battery Feed or Loss of Signal Ground	<u>GO to Pinpoint Test A .</u>
Continuous	2	Battery Voltage High	CHECK battery voltage; to be below 16 volts. REFER to <u>Section 414-00 .</u>
Continuous	2	Battery Voltage Low	CHECK battery voltage; to be above 9.0 volts. REFER to <u>Section 414-00 .</u>
Flashing (5Hz)	95	Incorrect Module Design Level ( RCM in Plant Mode Fault)	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
1-2	4	ECU is Faulted	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
1-3	5	Crash Data Memory Full	INSTALL a new RCM and impact sensors. REFER to <u>Inspection and Repair After a Supplemental Restraint System (SRS) Deployment</u> in this section.
1-4	6	Air Bag Diagnostic Monitor Ground Circuit Open	<u>GO to Pinpoint Test H .</u>
1-5	7	Incorrect Module Design Level	<u>GO to Pinpoint Test Z .</u>
1-6	81	Occupant Classification Sensor System Fault ( OCS Communication Fault)	<u>GO to Pinpoint Test I .</u>
1-8	86	PAD Warning Lamp Circuit Failure	<u>GO to Pinpoint Test D .</u>
1-9	46	Restraint System - Airbag Fault (Driver Squib 1 Open/High Resistance Fault)	<u>GO to Pinpoint Test K .</u>
2-1	54	Restraint System - Airbag Fault (Passenger Squib 1 Open/High Resistance Fault)	<u>GO to Pinpoint Test K .</u>
2-2	70	Restraint System - Side Airbag Fault (Driver Seat Side Air Bag Open/High Resistance Fault)	<u>GO to Pinpoint Test L .</u>
2-3	74	Restraint System - Side Airbag Fault (Passenger Seat Side Air Bag Open/High Resistance Fault)	<u>GO to Pinpoint Test L .</u>
3-3	62	Restraint System - Seat Belt Pretensioner Fault (Driver Open/High Resistance Fault)	<u>GO to Pinpoint Test J .</u>
3-4	66	Restraint System - Seat Belt Pretensioner Fault (Passenger Open/High Resistance Fault)	<u>GO to Pinpoint Test J .</u>
4-2	19	Restraint System - Impact Sensor Fault (LH Front Impact Severity Communication Fault)	<u>GO to Pinpoint Test M .</u>
4-3	29		<u>GO to Pinpoint Test M .</u>

		Restraint System - Impact Sensor Fault (Driver Side Communication Fault)	
4-4	34	Restraint System - Impact Sensor Fault (Passenger Side Communication Fault)	<u>GO to Pinpoint Test M .</u>
4-9	90	Front Driver's Seat Track Position Switch Circuit Open	<u>GO to Pinpoint Test Y .</u>
4-11	17	Restraint System - Impact Sensor Fault (LH Front Impact Severity Mounting Fault)	<u>GO to Pinpoint Test M .</u>
4-12	27	Restraint System - Impact Sensor Fault (Driver Side Mounting Fault)	<u>GO to Pinpoint Test M .</u>
4-13	32	Restraint System - Impact Sensor Fault (Passenger Side Mounting Fault)	<u>GO to Pinpoint Test M .</u>
5-1	38	Front Driver's Seat Belt Buckle Switch Circuit Open	<u>GO to Pinpoint Test N .</u>
5-2	42	Passengers Seat Belt Buckle Switch Circuit Open	<u>GO to Pinpoint Test R .</u>
5-3	94	Air Bag Tone Warning Indicator Circuit Open or Short to Ground	<u>GO to Pinpoint Test G .</u>
5-4	12	Module Configuration Error ( RCM Configured Incorrectly)	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
6-1	18	Restraint System - Impact Sensor Fault (LH Front Impact Severity Internal Fault)	<u>GO to Pinpoint Test M .</u>
6-2	28	Restraint System - Impact Sensor Fault (Driver Side Internal Fault)	<u>GO to Pinpoint Test M .</u>
6-3	33	Restraint System - Impact Sensor Fault (Passenger Side Internal Fault)	<u>GO to Pinpoint Test M .</u>
6-6	16	Restraint System - Impact Sensor Fault (LH Front Impact Severity Short to Ground Fault)	<u>GO to Pinpoint Test M .</u>
6-7	26	Restraint System - Impact Sensor Fault (Driver Side Short to Ground Fault)	<u>GO to Pinpoint Test M .</u>
6-8	31	Restraint System - Impact Sensor Fault (Passenger Side Short to Ground Fault)	<u>GO to Pinpoint Test M .</u>
6-11	15	Restraint System - Impact Sensor Fault (LH Front Impact Severity Short to Battery Fault)	<u>GO to Pinpoint Test M .</u>
6-12	25	Restraint System - Impact Sensor Fault (Driver Side Short to Battery Fault)	<u>GO to Pinpoint Test M .</u>
6-13	30	Restraint System - Impact Sensor Fault (Passenger Side Short to Battery Fault)	<u>GO to Pinpoint Test M .</u>
7-1	36	Front Driver's Seat Track Position Switch Circuit Short to Ground	<u>GO to Pinpoint Test P .</u>
7-2	40	Passengers Seat Belt Buckle Switch Circuit Short to Ground	<u>GO to Pinpoint Test T .</u>
7-3	88	Front Driver's Seat Track Position Switch Circuit Short to Ground	<u>GO to Pinpoint Test Z .</u>

# 2010 Crown Victoria, Grand Marquis Workshop Manual

7-5	37	Drivers Seat Belt Buckle Switch Circuit Resistance Out of Range	<u>GO to Pinpoint Test Q .</u>
7-6	41	Passengers Seat Belt Buckle Switch Circuit Resistance Out of Range	<u>GO to Pinpoint Test U .</u>
7-7	89	Front Driver's Seat Track Position Switch Circuit Resistance Out of Range	<u>GO to Pinpoint Test AA .</u>
7-9	35	Drivers Seat Belt Buckle Switch Circuit Short to Battery	<u>GO to Pinpoint Test Q .</u>
7-10	39	Passengers Seat Belt Buckle Switch Circuit Short to Battery	<u>GO to Pinpoint Test S .</u>
7-11	87	Front Driver's Seat Track Position Switch Short to Battery Fault	<u>GO to Pinpoint Test AB .</u>
7-13	91	Belt Tension Sensor Fault (Belt Tension Sensor Open or Short to Battery Fault)	<u>GO to Pinpoint Test W .</u>
7-14	92	Belt Tension Sensor Fault (Belt Tension Sensor Short to Ground Fault)	<u>GO to Pinpoint Test W .</u>
8-1	50	Restraint System - Air Bag Fault (Driver Squib 2 Open/High Resistance Fault)	<u>GO to Pinpoint Test K .</u>
8-2	58	Restraint System - Air Bag Fault (Passenger Squib 2 Open/High Resistance Fault)	<u>GO to Pinpoint Test K .</u>
8-3	45	Restraint System - Air Bag Fault (Driver Squib 1 Short to Ground Fault)	<u>GO to Pinpoint Test K .</u>
8-4	49	Restraint System - Air Bag Fault (Driver Squib 2 Short to Ground Fault)	<u>GO to Pinpoint Test K .</u>
8-5	53	Restraint System - Air Bag Fault (Passenger Squib 1 Short to Ground Fault)	<u>GO to Pinpoint Test K .</u>
8-6	57	Restraint System - Air Bag Fault (Passenger Squib 2 Short to Ground Fault)	<u>GO to Pinpoint Test K .</u>
8-7	44	Restraint System - Air Bag Fault (Driver Squib 1 Short to Battery Fault)	<u>GO to Pinpoint Test K .</u>
8-8	48	Restraint System - Air Bag Fault (Driver Squib 2 Short to Battery Fault)	<u>GO to Pinpoint Test K .</u>
8-9	52	Restraint System - Air Bag Fault (Passenger Squib 1 Short to Battery Fault)	<u>GO to Pinpoint Test K .</u>
8-10	56	Restraint System - Air Bag Fault (Passenger Squib 2 Short to Battery Fault)	<u>GO to Pinpoint Test K .</u>
8-11	47	Restraint System - Air Bag Fault (Driver Squib 1 Low Resistance Fault)	<u>GO to Pinpoint Test K .</u>
8-12	51	Restraint System - Air Bag Fault (Driver Squib 2 Low Resistance Fault)	<u>GO to Pinpoint Test K .</u>
8-13	55	Restraint System - Air Bag Fault (Passenger Squib 1 Low Resistance Fault)	<u>GO to Pinpoint Test K .</u>
8-14	39		<u>GO to Pinpoint Test K .</u>

# 2010 Crown Victoria, Grand Marquis Workshop Manual

		Restraint System - Air Bag Fault (Passenger Squib 2 Low Resistance Fault)	
9-1	69	Restraint System - Side Air Bag Fault (Driver Seat Side Air Bag Short to Ground Fault)	<u>GO to Pinpoint Test L .</u>
9-2	73	Restraint System - Side Air Bag Fault (Passenger Seat Side Air Bag Short to Ground Fault)	<u>GO to Pinpoint Test L .</u>
9-3	61	Restraint System - Seat Belt Pretensioner Fault (Driver Short to Ground Fault)	<u>GO to Pinpoint Test J .</u>
9-4	65	Restraint System - Seat Belt Pretensioner Fault (Passenger Short to Ground Fault)	<u>GO to Pinpoint Test J .</u>
9-5	68	Restraint System - Side Air Bag Fault (Driver Seat Side Air Bag Short to Battery Fault)	<u>GO to Pinpoint Test L .</u>
9-6	72	Restraint System - Side Air Bag Fault (Passenger Seat Side Air Bag Short to Battery Fault)	<u>GO to Pinpoint Test L .</u>
9-7	60	Restraint System - Seat Belt Pretensioner Fault (Driver Short to Battery Fault)	<u>GO to Pinpoint Test J .</u>
9-8	64	Restraint System - Seat Belt Pretensioner Fault (Passenger Short to Battery Fault)	<u>GO to Pinpoint Test J .</u>
9-9	71	Restraint System - Side Air Bag Fault (Driver Seat Side Air Bag Low Resistance Fault)	<u>GO to Pinpoint Test L .</u>
9-10	75	Restraint System - Side Air Bag Fault (Passenger Seat Side Air Bag Low Resistance Fault)	<u>GO to Pinpoint Test L .</u>
9-11	63	Restraint System - Seat Belt Pretensioner Fault (Driver Low Resistance Fault)	<u>GO to Pinpoint Test J .</u>
9-12	67	Restraint System - Seat Belt Pretensioner Fault (Passenger Low Resistance Fault)	<u>GO to Pinpoint Test J .</u>
10-14	85	PAD Warning Lamp Circuit Short to Battery	<u>GO to Pinpoint Test E .</u>
10-15	93	Air Bag Tone Warning Indicator Circuit Short to Battery	<u>GO to Pinpoint Test F .</u>
11-1	8	Incorrect Module Design Level ( RCM Version Conflicts with LH Front Impact Severity Sensor Version Fault)	<u>GO to Pinpoint Test X .</u>
11-2	10	Incorrect Module Design Level ( RCM Version Conflicts with Driver Side Impact Sensor Version Fault)	<u>GO to Pinpoint Test X .</u>
11-3	11	Incorrect Module Design Level ( RCM Version Conflicts with Passenger Side Impact Sensor Version Fault)	<u>GO to Pinpoint Test X .</u>
11-6	13	Module Configuration Error (Restraints Component Installed but not expected: OCS )	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
11-7	14		

		Module Configuration Error (Restraints Component Installed but not expected: PAD Indicator)	INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section.
11-8	80	Occupant Classification Sensor System Fault ( OCSM Fault)	<u>GO to Pinpoint Test I .</u>
11-9	83	Occupant Classification Sensor System Fault ( OCS Calibration Fault)	<u>GO to Pinpoint Test I .</u>
11-10	82	Occupant Classification Sensor System Fault ( OCS Sensing Element Fault)	<u>GO to Pinpoint Test I .</u>
11-11	84	Occupant Classification Sensor System Fault ( OCSM Mounting Fault)	<u>GO to Pinpoint Test I .</u>
12-1	9	Incorrect Module Design Level ( RCM Version Conflicts with RH Front Impact Severity Sensor Version Fault)	<u>GO to Pinpoint Test AB .</u>
12-2	22	Restraint System - Impact Sensor Fault (RH Front Impact Severity Communication Fault)	<u>GO to Pinpoint Test M .</u>
12-3	23	Restraint System - Impact Sensor Fault (RH Impact Severity Internal Fault)	<u>GO to Pinpoint Test M .</u>
12-4	24	Restraint System - Impact Sensor Fault (RH Front Impact Severity Communication Fault)	<u>GO to Pinpoint Test M .</u>
12-5	21	Restraint System - Impact Sensor Fault (RH Impact Severity Short to Ground Fault)	<u>GO to Pinpoint Test M .</u>
12-6	20	Restraint System - Impact Sensor Fault (RH Impact Severity Short to Battery Fault)	<u>GO to Pinpoint Test M .</u>
12-11	43	Cross Link Between Firing Loops	<u>GO to Pinpoint Test V .</u>

<sup>a</sup> LFC: Flashed on air bag warning indicator.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: The Air Bag Warning Indicator is Illuminated Continuously

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Normal Operation

During normal operation, the Restraints Control Module (RCM) will illuminate the air bag warning indicator continuously for approximately 6 seconds and then go out after the ignition is placed in the ON or START position and no Supplemental Restraint System (SRS) faults exist. The air bag warning indicator will remain illuminated continuously after 3 cycles of a Lamp Fault Code (LFC), if a fault exists. Be sure to cycle the ignition and look for an approximate 6-second indicator prove-out without LFCs .

The RCM will communicate DTCs to the scan tool through the Data Link Connector (DLC). If the scan tool displays NO COMMUNICATION when retrieving DTCs, refer to [Section 418-00](#) to diagnose the no communication concern.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Instrument Cluster (IC) module
- RCM disconnected
- RCM

**PINPOINT TEST A: THE AIR BAG WARNING INDICATOR IS ILLUMINATED CONTINUOUSLY**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

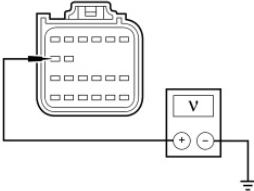
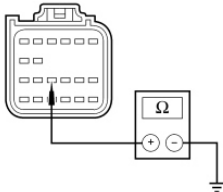
**NOTE:** The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

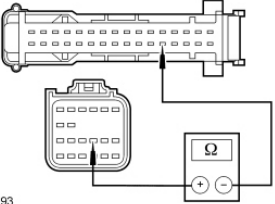
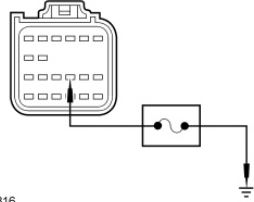
**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>A1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Were any DTCs retrieved during self-test?</b></li> </ul>	<p><b>Yes</b> If CMDTCs were retrieved, GO to <a href="#">A2</a> . If on-demand DTCs were retrieved, GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> GO to <a href="#">A2</a> .</p>
<b>A2 CHECK THE RCM CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> </ul>	<p><b>Yes</b> GO to <a href="#">A3</a> .</p>



<ul style="list-style-type: none"> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Inspect RCM C310a to be fully seated and locked. Seat and lock connector(s) as necessary.</li> <li>• <b>Is RCM C310a fully connected and the connector locking tab engaged?</b></li> </ul>	<p><b>No</b> CONNECT C310a and ENGAGE the locking tab. GO to <u>A7</u> .</p>
<p><b>A3 CHECK CIRCUIT 937 (RD/WH) FOR VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Deactivate the SRS . Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between RCM C310a-12, circuit 937 (RD/WH), harness side and ground.</li> </ul>  <p>A0039638</p> <ul style="list-style-type: none"> <li>• <b>Is voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> VERIFY that Central Junction Box (CJB) fuse 22 (10A) is OK. If OK, REPAIR circuit 937 (RD/WH). GO to <u>A7</u> . If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.</p>
<p><b>A4 CHECK FOR AN OPEN GROUND CIRCUIT</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between RCM C310a-16, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>A0039639</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> REPAIR circuit 676 (PK/OG). GO to <u>A7</u> .</p>
<p><b>A5 CHECK CIRCUIT 608 (BK/YE) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: IC Module C2220.</li> <li>• Measure the resistance between IC module C2220-12, circuit 608 (BK/YE), harness side and RCM C310a-15, circuit 608 (BK/YE), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> REPAIR circuit 608 (BK/YE). GO to <u>A7</u> .</p>

 <p>N0032293</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<b>A6 CHECK THE AIR BAG WARNING INDICATOR OPERATION (DRIVE INDICATOR OFF)</b>	
<ul style="list-style-type: none"> <li>• Connect: IC Module C2220.</li> <li>• Ignition ON.</li> <li>• Connect a fused jumper wire between RCM C310a-15, circuit 608 (BK/YE), harness side and ground.</li> </ul>  <p>N0074816</p> <ul style="list-style-type: none"> <li>• Is the air bag warning indicator off?</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>A7</u> .</p> <p><b>No</b> INSTALL a new IC module. REFER to <u>Section 413-01</u> . GO to <u>A7</u> .</p>
<b>A7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected). <ul style="list-style-type: none"> <li>◆ If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>◆ If previously directed to deactivate the SRS , reactivate the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> </ul> </li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Are any DTCs retrieved on-demand during self-test?</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test B: DTC B1869**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Normal Operation**

During normal operation, the Restraints Control Module (RCM) will illuminate the air bag warning indicator continuously for approximately 6 seconds and then go out after the ignition is placed in the ON or START position and no air bag faults exist. The air bag warning indicator will remain illuminated continuously after 3 cycles of a Lamp Fault Code (LFC), if a fault exists. Be sure to cycle the ignition and look for an approximate 6-second indicator prove-out without LFCs .

If the RCM detects an open or short to ground on the air bag warning indicator circuit, it will store DTC B1869 in memory and sound the secondary air bag warning.

- DTC B1869 (Lamp Air Bag Warning Indicator Circuit Open or Short to Ground) - If the RCM detects an open circuit or short to ground when the indicator is not active, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RCM
- Air bag warning indicator
- Instrument Cluster (IC) module

**PINPOINT TEST B: DTC B1869**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

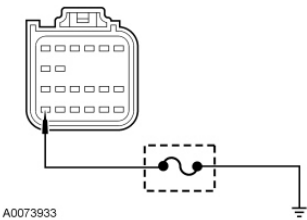
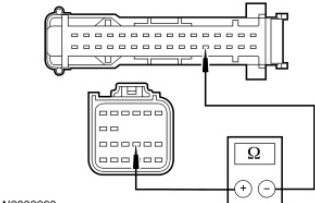
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

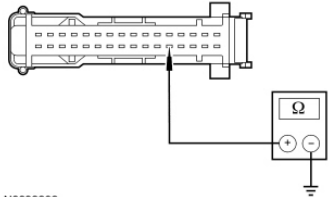
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>B1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> </ul>	<p><b>Yes</b> If the air bag warning indicator lamp <b>does</b> illuminate, GO to <u>B2</u> .</p>

<ul style="list-style-type: none"> <li>• Was DTC B1869 retrieved on-demand during self-test?</li> </ul>	<p>If the air bag warning indicator <b>does not</b> illuminate, GO to <u>B4</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>B6</u> .</p>
<p><b>B2 CHECK THE AIR BAG WARNING INDICATOR OPERATION (DRIVE INDICATOR OFF)</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Deactivate the SRS . Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Ignition ON.</li> <li>• Connect a fused jumper wire between RCM C310a-24, circuit 1632 (TN/LB), harness side and ground.</li> </ul>  <p>A0073933</p> <ul style="list-style-type: none"> <li>• Is the air bag warning indicator off?</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>B7</u> .</p> <p><b>No</b> GO to <u>B3</u> .</p>
<p><b>B3 CHECK CIRCUIT 608 (BK/YE) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC Module C2220.</li> <li>• Measure the resistance between IC module C2220-12, circuit 608 (BK/YE), harness side and RCM C310a-15, circuit 608 (BK/YE), harness side.</li> </ul>  <p>N0032293</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> INSTALL a new IC module. REFER to <u>Section 413-01</u> . GO to <u>B7</u> .</p> <p><b>No</b> REPAIR circuit 608 (BK/YE). GO to <u>B7</u> .</p>
<p><b>B4 CHECK THE AIR BAG WARNING INDICATOR OPERATION (DRIVE INDICATOR ON)</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• <b>Is the air bag warning indicator on?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>B7</u> .</p> <p><b>No</b> GO to <u>B5</u> .</p>
<p><b>B5 CHECK CIRCUIT 608 (BK/YE) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: IC Module C2220.</li> <li>• Measure the resistance between IC module C2220-12, 608 (BK/YE), harness side and ground.</li> </ul>  <p>N0032292</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC module. REFER to <u>Section 413-01</u> . GO to <u>B7</u> .</p> <p><b>No</b> REPAIR circuit 608 (BK/YE). GO to <u>B7</u> .</p>
<p><b>B6 CHECK FOR AN INTERMITTENT FAULT</b></p>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1869 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>GO to <u>B2</u> .</p> <p><b>No</b> CHECK for causes of intermittent open or short to ground on circuit 608 (BK/YE). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>B7</u> .</p>
<p><b>B7 CHECK FOR ADDITIONAL SRS DTCs</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected). <ul style="list-style-type: none"> <li>♦ If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>♦ If previously directed to deactivate the SRS , reactivate the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> </ul> </li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>
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### Pinpoint Test C: DTC B1870

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Normal Operation

During normal operation, the Restraints Control Module (RCM) will illuminate the air bag warning indicator continuously for approximately 6 seconds and then go out after the ignition is placed in the ON or START position and no air bag faults exist. The air bag warning indicator will remain illuminated continuously after 3 cycles of a Lamp Fault Code (LFC), if a fault exists.

If the RCM detects a short to battery on the air bag warning indicator circuit, it will store DTC B1870 in memory and sound the secondary air bag warning.

- DTC B1870 (Air Bag Warning Indicator Circuit Short to Battery) - If the RCM detects a short to battery on the air bag warning indicator circuit, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Instrument Cluster (IC) module
- RCM

**PINPOINT TEST C: DTC B1870**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

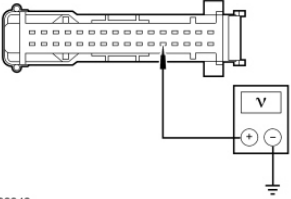
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>C1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B1870 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>C2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>C4</u> .</p>
<b>C2 CHECK CIRCUIT 608 (BK/YE) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: IC Module C2220.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Ignition ON.</li> <li>Measure the voltage between IC module C2220-12, circuit 608 (BK/YE), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 608 (BK/YE). GO to <u>C5</u> .</p> <p><b>No</b> GO to <u>C3</u> .</p>

 <p>N0032348</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<b>C3 CHECK THE RCM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>NOTE:</b> DTC B1869 should be retrieved when carrying out the self test due to an open on circuit 608 (BK/YE), DTC B1870 should not be retrieved at this time.</li> <li>• <b>Was DTC B1870 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>C5</u> .</p> <p><b>No</b> INSTALL a new IC module. REFER to <u>Section 413-01</u> . GO to <u>C5</u> .</p>
<b>C4 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1870 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>C2</u> .</p> <p><b>No</b> CHECK for causes of intermittent short to battery on circuit 608 (BK/YE). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>C5</u> .</p>
<b>C5 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Chart in this section for</p>



<ul style="list-style-type: none"> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved indicating a fault?</b></li> </ul>	<p>pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>
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#### Pinpoint Test D: DTC B1884

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B1884:

- LFC 1-8 - PAD Warning Lamp Circuit Failure

#### Normal Operation

The RCM briefly activates the PAD indicator to verify to the occupants correct functional operation of the PAD indicator.

If the RCM detects an open or short to ground on the PAD indicator circuit, it will store DTC B1884 in memory, flash LFC 1-8 on the air bag warning indicator.

- DTC B1884 ( PAD Warning Lamp Circuit Failure) - If the RCM detects an open or short to ground when the indicator is not active, it will set this DTC.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- PAD indicator
- RCM

#### PINPOINT TEST D: DTC B1884

**⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate**

vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

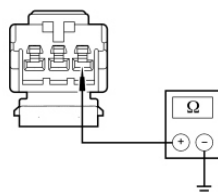
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

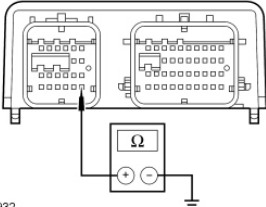
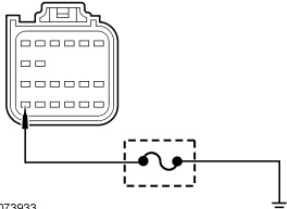
**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

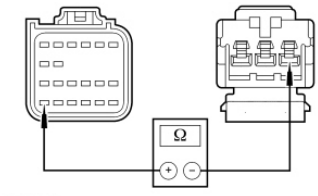
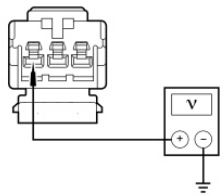
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>D1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B1884 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>If the PAD indicator <b>does</b> illuminate continuously, GO to <u>D2</u> . If the PAD indicator <b>does not</b> illuminate, GO to <u>D4</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>D8</u> .</p>
<b>D2 CHECK CIRCUIT 1632 (TN/LB) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: PAD Indicator C2286.</li> <li>Measure the resistance between PAD indicator C2286-3, circuit 1632 (TN/LB), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> GO to <u>D3</u> .</p>



N0015539

<ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>D3 CHECK THE RCM</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a pin 24, component side and ground.</li> </ul>  <p>A0073932</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1632 (TN/LB). GO to <u>D9</u> .</p> <p><b>No</b> GO to <u>D7</u> .</p>
<b>D4 CHECK THE PAD INDICATOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Deactivate the SRS . Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Ignition ON.</li> <li>• Connect a fused jumper lead between RCM C310a-24, circuit 1632 (TN/LB), harness side and ground.</li> </ul>  <p>A0073933</p> <ul style="list-style-type: none"> <li>• Is the PAD indicator on?</li> </ul>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> GO to <u>D5</u> .</p>
<b>D5 CHECK CIRCUIT 1632 (TN/LB) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PAD Indicator C2286.</li> <li>• Measure the resistance between PAD indicator C2286-3, circuit 1632 (TN/LB), harness side and RCM C310a-24, circuit 1632 (TN/LB), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>D6</u> .</p> <p><b>No</b> REPAIR circuit 1632 (TN/LB). GO to <u>D9</u> .</p>

 <p>N0015536</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>D6 CHECK CIRCUIT 937 (RD/WH) FOR VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between PAD indicator C2286-1, circuit 937 (RD/WH), harness side and ground.</li> </ul>  <p>N0015537</p> <ul style="list-style-type: none"> <li>• Is voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new PAD indicator. REFER to <u>Passenger Air Bag Deactivation (PAD) Indicator</u> in this section. GO to <u>D9</u> .</p> <p><b>No</b> REPAIR circuit 937 (RD/WH). GO to <u>D9</u> .</p>
<p><b>D7 CONFIRM THE RCM FAULT</b></p>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connector are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: PAD Indicator C2286.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1884 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>D9</u> .</p> <p><b>No</b> CHECK for causes of intermittent open or short to ground on circuit 1632 (TN/LB). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>D9</u> .</p>
<p><b>D8 CHECK FOR AN INTERMITTENT FAULT</b></p>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1884 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>If the PAD indicator <b>does</b> illuminate, GO to <u>D2</u> .</p>

	<p>If the PAD indicator <b>does not</b> illuminate continuously, GO to <u>D4</u> .</p> <p><b>No</b> CHECK for causes of intermittent open or short to ground on circuit 1632 (TN/LB). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>D9</u> .</p>
<b>D9 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected). <ul style="list-style-type: none"> <li>♦ If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>♦ If previously directed to deactivate the SRS , reactivate the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> </ul> </li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test E: DTC B1890**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B1890:

- LFC 10-14 - PAD Warning Lamp Circuit Short to Battery

**Normal Operation**

The RCM briefly activates the PAD indicator to verify to the occupants correct functional operation of the PAD indicator.

If the RCM detects a short to battery on the PAD indicator circuit, it will store DTC B1890 in memory, flash LFC 10-14 on the air bag warning indicator.

- DTC B1890 (PAD Warning Lamp Circuit Short to Battery) - If the RCM detects a short to battery on the PAD indicator circuit when the indicator is activated, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- PAD indicator
- RCM

**PINPOINT TEST E: DTC B1890**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

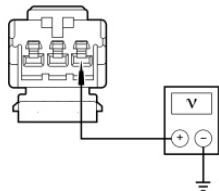
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>E1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1890 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>GO to <u>E2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>E4</u> .</p>

E2 CHECK CIRCUIT 1632 (TN/LB) FOR A SHORT TO VOLTAGE	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: PAD Indicator C2286.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between PAD indicator C2286-3, circuit 1632 (TN/LB), harness side and ground.</li> </ul>  <p>N0015538</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1632 (TN/LB). GO to <u>E5</u> .</p> <p><b>No</b> GO to <u>E3</u> .</p>
E3 CHECK THE RCM	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>NOTE:</b> DTC B1884 should be retrieved when carrying out the self test due to an open on circuit 1632 (TN/LB), DTC B1890 should not be retrieved at this time.</li> <li>• Was DTC B1890 retrieved on-demand during self-test?</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>E5</u> .</p> <p><b>No</b> INSTALL a new PAD indicator. REFER to <u>Passenger Air Bag Deactivation (PAD) Indicator</u> in this section. GO to <u>E5</u> .</p>

<b>E4 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1890 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>E2</u> .</p> <p><b>No</b> CHECK for causes of intermittent short to battery on circuit 1632 (TN/LB). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>E5</u> .</p>
<b>E5 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved indicating a fault?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test F: DTC B1891**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B1891:

- LFC 10-15 - Air Bag Tone Warning Indicator Circuit Short to Battery



**Normal Operation**

The Restraints Control Module (RCM) monitors its connection to the Lighting Control Module (LCM) at C310a pin 23. This connection is used to signal a chime if the air bag warning indicator is inoperative and another Supplemental Restraint System (SRS) fault exists.

If the RCM detects a short to battery on the connection to the LCM , it will store DTC B1891 in memory and flash LFC 10-15 on the air bag warning indicator.

- DTC B1891 (Air Bag Tone Warning Indicator Circuit Short to Battery) - If the RCM detects a short to battery on the air bag tone warning indicator circuit, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LCM
- RCM

**PINPOINT TEST F: DTC B1891**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

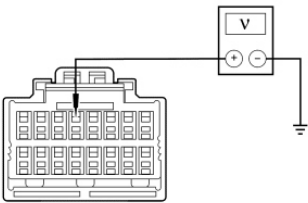
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>F1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1891 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>F2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>F4</u> .</p>
<b>F2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT FOR A SHORT TO</b>	

<b>VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between LCM C2145a-4, circuit 1083 (LB/PK), harness side and ground.</li> </ul>  <p>N0032296</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1083 (LB/PK). GO to <u>F5</u> .</p> <p><b>No</b> GO to <u>F3</u> .</p>
<b>F3 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>NOTE:</b> DTC B1892 should be retrieved when carrying out the self test due to an open circuit 1083 (LB/PK), DTC B1891 should not be retrieved at this time.</li> <li>• <b>Was DTC B1891 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>F5</u> .</p> <p><b>No</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . GO to <u>F5</u> .</p>
<b>F4 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1891 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and DTC is no longer retrieved on-demand during self test. GO to <u>F2</u> .</p> <p><b>No</b> CHECK for causes of an intermittent short to voltage on circuit 1083 (LB/BK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS</b></p>

	<b>components at this time. SRS components should only be installed when directed to do so in the pinpoint test. REPAIR</b> any intermittent wiring, terminal or connector concerns found. GO to <b>F5</b> .
<b>F5 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved indicating a fault?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

### Pinpoint Test G: DTC B1892

Refer to Wiring Diagrams Cell **46** , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B1892:

- LFC 5-3 - Air Bag Tone Warning Indicator Circuit Open or Short to Ground

#### Normal Operation

The connection between the Lighting Control Module (LCM) and the Restraints Control Module (RCM) is used to signal a chime if the primary air bag warning indicator is inoperative and another Supplemental Restraint System (SRS) fault exists. The RCM monitors its connection to the LCM at C310a Pin 23.

If the RCM detects an open or short to ground on the circuit to the LCM , it will store DTC B1892 in memory, flash LFC 5-3 on the air bag warning indicator.

- DTC B1892 (Air Bag Tone Warning Indicator Circuit Open or Short to Ground) - If the RCM detects an open circuit or short to ground when the indicator is not active, it will set this DTC.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LCM
- RCM

**PINPOINT TEST G: DTC B1892**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

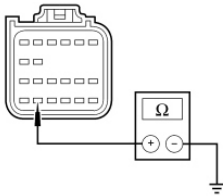
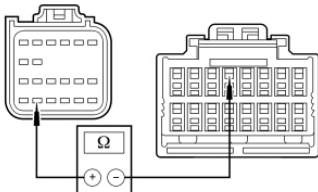
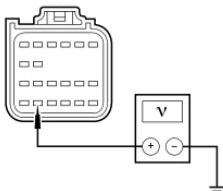
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>G1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B1892 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>G2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>G6</u> .</p>
<b>G2 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Disconnect: LCM C2145a.</li> <li>Measure the resistance between RCM C310a-23, circuit 1083 (LB/PK), harness side ground.</li> </ul>	<p><b>Yes</b> GO to <u>G3</u> .</p> <p><b>No</b> REPAIR circuit 1083 (LB/PK). GO to <u>G7</u> .</p>

 <p>A0075138</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>G3 CHECK THE AIR BAG TONE WARNING INDICATOR CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310a-23, circuit 1083 (LB/PK), harness side and LCM C2145a-4, circuit 1083 (LB/PK), harness side.</li> </ul>  <p>N0032295</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>G4</u> .</p> <p><b>No</b> REPAIR circuit 1083 (LB/PK). GO to <u>G7</u> .</p>
<b>G4 CHECK THE AIR BAG TONE WARNING INDICATOR</b>	
<ul style="list-style-type: none"> <li>• Connect: LCM C2145a.</li> <li>• Deactivate the system. Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between RCM C310a-23, circuit 1083 (LB/PK), harness side and ground.</li> </ul>  <p>A0074737</p> <ul style="list-style-type: none"> <li>• Is voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>G5</u> .</p> <p><b>No</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . GO to <u>G7</u> .</p>
<b>G5 CONFIRM THE RCM FAULT</b>	
	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control</u></p>

<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: LCM C2145a.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1892 retrieved on-demand during self-test?</b></li> </ul>	<p><u>Module (RCM)</u> in this section. GO to <u>G7</u> .</p> <p><b>No</b> CHECK for causes of intermittent short to ground or open on circuit 1083 (LB/PK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>G7</u> .</p>
<p><b>G6 CHECK FOR AN INTERMITTENT FAULT</b></p>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1892 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>G2</u> .</p> <p><b>No</b> CHECK for causes of intermittent short to ground or open on circuit 1083 (LB/PK). ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>G7</u> .</p>
<p><b>G7 CHECK FOR ADDITIONAL SRS DTCs</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

<ul style="list-style-type: none"> <li>◆ If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>◆ If previously directed to deactivate the SRS , reactivate the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	
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**Pinpoint Test H: B1921**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B1921:

- LFC 1-4 - Air Bag Diagnostic Monitor Ground Circuit Open

**⚠ WARNING:** Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.

**NOTE:** A resistance difference as low as 10 ohms may set the LFC .

**Normal Operation**

The Restraints Control Module (RCM) monitors the resistance between the ground connections at the mounting bracket and the reference ground at the C310a Pin 16, circuit 676 (PK/OG).

If the RCM detects a difference in resistance, it will store DTC B1921 in memory, flash LFC 1-4 on the air bag warning indicator.

- DTC B1921 (Air Bag Diagnostic Monitor Ground Circuit Open) - If the RCM detects a difference in resistance between the ground circuit and the RCM mounting ground, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- RCM bracket not securely mounted
- Wiring, terminals or connectors
- RCM

**PINPOINT TEST H: DTC B1921**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

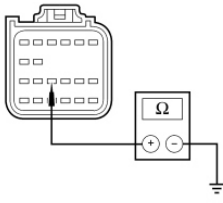
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>H1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B1921 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>H2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>H6</u> .</p>
<b>H2 INSPECT THE RCM MOUNTING AND MOUNTING SURFACE</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Inspect the RCM mounting bolts and make sure they are fully seated and tightened correctly.</li> <li>Remove the RCM . Refer to <u>Restraints Control Module (RCM)</u> in this section.</li> <li>Inspect the RCM and mounting surface for damage, corrosion or dirt.</li> <li><b>Was a significant amount of corrosion or dirt found, or was the RCM attached to the mounting surface incorrectly or were the RCM retainers not fully seated and</b></li> </ul>	<p><b>Yes</b> CLEAN and TIGHTEN the retainers. REPAIR the mounting surface as necessary. REINSTALL the RCM and mounting bracket to the mounting surface. GO to <u>H7</u> .</p> <p><b>No</b> GO to <u>H3</u> .</p>



tightened correctly?	
<b>H3 INSTALL THE RCM AND CARRY OUT THE ON-DEMAND SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Clean the RCM mounting surface.</li> <li>• Install the RCM . Refer to <u>Restraints Control Module (RCM)</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1921 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>H4</u> .</p> <p><b>No</b> CHECK for causes of intermittent high resistance on circuit 676 (PK/OG) or the chassis ground. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>H7</u> .</p>
<b>H4 CHECK GROUND CIRCUIT 676 (PK/OG) FOR HIGH RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a-16, circuit 676 (PK/OG), harness side and the RCM case ground.</li> </ul>  <p>A0039639</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>H5</u> .</p> <p><b>No</b> REPAIR circuit 676 (PK/OG). GO to <u>H7</u> .</p>
<b>H5 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS)</u></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>H7</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring,</p>

<p><u>Depowering and Repowering</u> in this section.</p> <ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1892 retrieved on-demand during self-test?</b></li> </ul>	<p>terminal or connector concerns found. GO to <u>H7</u> .</p>
<b>H6 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B1921 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>H2</u> .</p> <p><b>No</b> CHECK for causes of intermittent high resistance on circuit 676 (PK/OG) or the chassis ground. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>H7</u> .</p>
<b>H7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test I: DTC B2290**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Codes (LFCs) indicate the specific fault PIDs associated with DTC B2290:

<b>LFC</b>	<b>Description</b>
1-6	OCS Communication Fault
11-8	OCS Module Fault
11-9	OCS Calibration Fault
11-10	OCS Sensing Element Fault
11-11	OCS Mounting Fault

**Normal Operation**

The Occupant Classification System (OCS) system is used to classify the front passenger seat occupant in the event of a deployable impact. The OCS system components (seat cushion foam pad, bladder with pressure sensor and Occupant Classification System Module (OCSM)) are calibrated to each other and are serviced as an assembly. The OCS system components are not to be installed separately. If a new OCS system, OCS system component or seat cushion foam pad are needed, a new OCS system service kit (seat cushion foam pad, bladder with pressure sensor and OCSM ) must be installed as an assembly.

The Restraints Control Module (RCM) communicates with the OCS system for faults. If the RCM detects one of the following faults on any of the OCS system circuits, it will store DTC B2290 in memory and, depending on the fault, flash a LFC on the air bag warning indicator.

<b>Fault PIDs <sup>a</sup></b>	<b>Description</b>	<b>Fault Trigger Condition</b>
2290_24_OD and 2290_24_CM	OCS Sensing Element Fault, Front Pass. Side	When the Occupant Classification System Module (OCSM) senses a fault with the bladder pressure sensor circuits, a fault will be indicated.
2290_25_OD and 2290_25_CM	OCS Calibration Fault, Front Pass. Side	When the OCSM senses a difference in calibration values, a fault will be indicated.
2290_26_OD and 2290_26_CM	OCS Communications Fault, Front Pass. Side	When the OCSM is not able to communicate with the Restraints Control Module (RCM), a fault will be indicated.
2290_27_OD and 2290_27_CM	Generic OCS Module Fault, Front Pass. Side	When the OCSM senses a fault with the bladder pressure sensor and/or circuits, a fault will be indicated.
2290_28_OD and 2290_28_CM	Occupant Classification Sensor Mounting Fault, Front Passenger Side	When the OCSM senses a fault with one of its components, a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2290. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC B2290.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors

- OCS system component
- Pressure sensing fault
- Module mounting condition

**PINPOINT TEST I: DTC B2290**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

**NOTE:** To identify between a production OCS system and a OCS system service kit, inspect the OCSM electrical connector. A production OCS system allows the disconnection of the electrical connector from the OCSM . A OCS system service kit has the OCSM electrical connector glued to the module, it cannot and should not be disconnected or altered.

Test Step	Result / Action to Take
<b>I1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All B2290 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2290 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2290 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p><b>Vehicles with a production OCS system</b></p>

For 2290\_26\_OD ( OCS Communications Fault, Front Pass. side) ( LFC 1-6), GO to I2 .

For 2290\_28\_OD (Occupant Classification Sensor Mounting Fault, Front Passenger Side) ( LFC 11-11), GO to I19 .

For 2290\_27\_OD (Generic OCS Module Fault, Front Pass. side) ( LFC 11-8), INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to I21 .

For 2290\_25\_OD ( OCS Calibration Fault, Front Pass. side) ( LFC 11-9), GO to I20 .

For 2290\_24\_OD ( OCS Sensing Element Fault, Front Pass. side) (11-10), GO to I11 .

#### **Vehicles with a OCS service kit**

For 2290\_26\_OD ( OCS Communications Fault, Front Pass. side) ( LFC 1-6), GO to I2 .

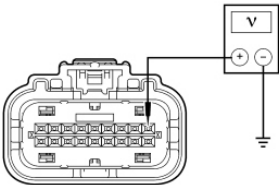
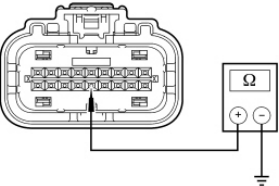
For 2290\_27\_OD (Generic OCS Module Fault, Front Pass. side) ( LFC 11-8), INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to I21 .

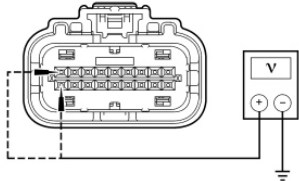
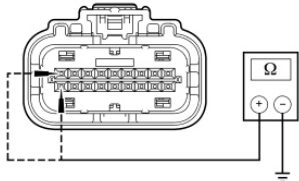
For 2290\_25\_OD ( OCS Calibration Fault, Front Pass. side) ( LFC 11-9), GO to I20 .

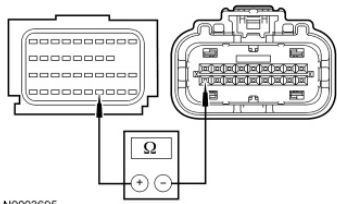
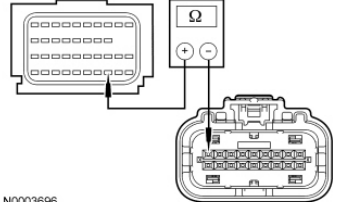
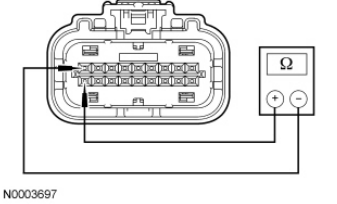
For 2290\_24\_OD ( OCS Sensing Element Fault, Front Pass. side) ( LFC 11-10), INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to I21 .

#### **No**

This is an intermittent fault when present as a continuous memory DTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to I21 .

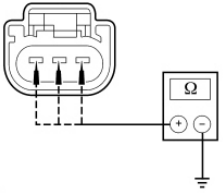
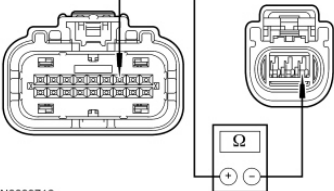
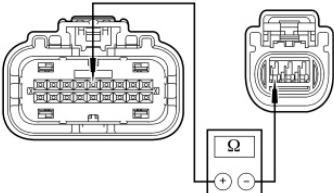
<b>I2 CHECK THE SEAT WIRING AND CONNECTORS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Carry out a thorough visual inspection of the OCS system wiring, terminals and connectors, the RCM wiring, terminals and connectors at C310b-33 and 34, and the related seat wiring harness and body wiring harness terminals and connectors.</li> <li>• <b>Were any problems noted?</b></li> </ul>	<p><b>Yes</b> REPAIR the seat connectors and wiring as needed. GO to <u>I22</u> .</p> <p><b>No</b> GO to <u>I3</u> .</p>
<b>I3 CHECK CIRCUIT 937 (RD/WH) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Side Air Bag Module C316.</li> <li>• Connect: Restraint System Diagnostic Tool 418-133 to Passenger Seat Side Air Bag Module C316.</li> <li>• Disconnect: OCSM C3043.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between OCSM C3043-1, circuit 937 (RD/WH), harness side and ground.</li> </ul>  <p>N0003691</p> <ul style="list-style-type: none"> <li>• <b>Is voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> REPAIR circuit 937 (RD/WH). GO to <u>I22</u> .</p>
<b>I4 CHECK GROUND CIRCUIT 676 (PK/OG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Measure the resistance between OCSM C3043-14, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0003692</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5.0 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>I5</u> .</p> <p><b>No</b> REPAIR circuit 676 (PK/OG). GO to <u>I22</u> .</p>

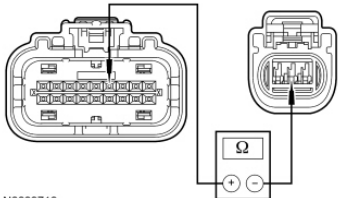
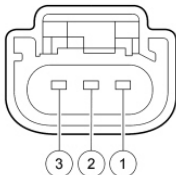
<b>I5 CHECK CIRCUITS 1918 (BN/WH) AND 1919 (PK/OG) FOR A SHORT TO VOLTAGE BETWEEN THE OCSM AND RCM</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between OCSM :             <ul style="list-style-type: none"> <li>♦ C3043-18, circuit 1918 (BN/WH), harness side and ground.</li> <li>♦ C3043-9, circuit 1919 (PK/OG), harness side and ground.</li> </ul> </li> </ul>  <p>N0003693</p> <p>• Is voltage present on either circuit?</p>	<p><b>Yes</b> REPAIR circuit 1918 (BN/WH) or 1919 (PK/OG). GO to <u>I22</u> .</p> <p><b>No</b> GO to <u>I6</u> .</p>
<b>I6 CHECK CIRCUITS 1918 (BN/WH) AND 1919 (PK/OG) FOR A SHORT TO GROUND BETWEEN THE OCSM AND RCM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Measure the resistance between OCSM :             <ul style="list-style-type: none"> <li>♦ C3043-18, circuit 1918 (BN/WH), harness side and ground.</li> <li>♦ C3043-9, circuit 1919 (PK/OG), harness side and ground.</li> </ul> </li> </ul>  <p>N0003694</p> <p>• Are the resistances greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>I7</u> .</p> <p><b>No</b> REPAIR circuit 1918 (BN/WH) or 1919 (PK/OG). GO to <u>I22</u> .</p>
<b>I7 CHECK CIRCUIT 1918 (BN/WH) FOR AN OPEN BETWEEN THE OCSM AND THE RCM</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-34, circuit 1918 (BN/WH), harness side and OCSM C3043-18, circuit 1918 (BN/WH), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>I8</u> .</p> <p><b>No</b> REPAIR circuit 1918 (BN/WH). GO to <u>I22</u> .</p>

 <p>N0003695</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<b>I8 CHECK CIRCUIT 1919 (PK/OG) FOR AN OPEN BETWEEN THE OCSM AND THE RCM</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-33, circuit 1919 (PK/OG), harness side and OCSM C3043-9, circuit 1919 (PK/OG), harness side.</li> </ul>  <p>N0003696</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>I9</u> .</p> <p><b>No</b> REPAIR circuit 1919 (PK/OG). GO to <u>I22</u> .</p>
<b>I9 CHECK FOR A SHORT BETWEEN HS-CAN CIRCUITS 1918 (BN/WH) AND 1919 (PK/OG)</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between OCSM C3043-18, circuit 1918 (BN/WH), harness side and OCSM C3043-9, circuit 1919 (PK/OG), harness side.</li> </ul>  <p>N0003697</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>I10</u> .</p> <p><b>No</b> REPAIR circuits 1918 (BN/WH) and 1919 (PK/OG). GO to <u>I22</u> .</p>
<b>I10 CHECK THE RCM</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors, OCS system components and the RCM electrical connector are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Install a known good RCM . Refer to <u>Restraints Control Module (RCM)</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> </ul>	<p><b>Yes</b> INSTALL a new OCS system service kit. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>I22</u> .</p> <p><b>No</b> Fault corrected. GO to <u>I22</u> .</p>



<ul style="list-style-type: none"> <li>• Connect: OCSM C3043.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2290 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2290 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2290 fault PIDs indicate a fault?</b></li> </ul>	
<b>I11 CHECK THE SEAT WIRING AND CONNECTORS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Carry out a thorough visual inspection of the OCS system wiring, terminals and connectors and the related seat wiring harness terminals and connectors.</li> <li>• <b>Were any problems noted?</b></li> </ul>	<p><b>Yes</b> REPAIR the seat connectors and wiring as needed. GO to <u>I22</u> .</p> <p><b>No</b> GO to <u>I12</u> .</p>
<b>I12 CHECK CIRCUITS 1568 (RD/WH), 1569 (GY/LB) AND 1570 (TN/BK) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Passenger Seat Side Air Bag Module C316.</li> <li>• Connect: Restraint System Diagnostic Tool 418-133 to Passenger Seat Side Air Bag Module C316 .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: OCS Pressure Sensor C3042.</li> <li>• Disconnect: OCSM C3043.</li> <li>• Repower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between OCS pressure sensor: <ul style="list-style-type: none"> <li>◆ C3042-1, circuit 1568 (RD/WH), harness side and ground.</li> <li>◆ C3042-2, circuit 1570 (TN/BK), harness side and ground.</li> <li>◆ C3042-3, circuit 1569 (GY/LB), harness side and ground.</li> </ul> </li> </ul> <div> <p>A0074066</p> </div> <ul style="list-style-type: none"> <li>• <b>Is voltage present on any circuit?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 1568 (RD/WH), 1569 (GY/LB) or 1570 (TN/BK). GO to <u>I22</u> .</p> <p><b>No</b> GO to <u>I13</u> .</p>
<b>I13 CHECK CIRCUITS 1568 (RD/WH), 1569 (GY/LB) AND 1570 (TN/BK) FOR A SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Measure the resistance between OCS pressure sensor:             <ul style="list-style-type: none"> <li>◆ C3042-1, circuit 1568 (RD/WH), harness side and ground.</li> <li>◆ C3042-2, circuit 1570 (TN/BK), harness side and ground.</li> <li>◆ C3042-3, circuit 1569 (GY/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0074067</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>I14</u> .</p> <p><b>No</b> REPAIR circuit 1568 (RD/WH), 1569 (GY/LB) or 1570 (TN/BK). GO to <u>I22</u> .</p>
<b>I14 CHECK CIRCUIT 1568 (RD/WH) FOR AN OPEN BETWEEN THE OCSM AND THE PRESSURE SENSOR</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between OCSM C3043-3, circuit 1568 (RD/WH), harness side and OCS pressure sensor C3042-1, circuit 1568 (RD/WH), harness side.</li> </ul>  <p>N0003712</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 0.5 ohm?</b></li> </ul>	<p><b>Yes</b> GO to <u>I15</u> .</p> <p><b>No</b> REPAIR circuit 1568 (RD/WH). GO to <u>I22</u> .</p>
<b>I15 CHECK CIRCUIT 1569 (GY/LB) FOR AN OPEN BETWEEN THE OCS MODULE AND THE PRESSURE SENSOR</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between OCSM C3043-5, circuit 1569 (GY/LB), harness side and OCS pressure sensor C3042-3, circuit 1569 (GY/LB), harness side.</li> </ul>  <p>N0003699</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 0.5 ohm?</b></li> </ul>	<p><b>Yes</b> GO to <u>I16</u> .</p> <p><b>No</b> REPAIR circuit 1569 (GY/LB). GO to <u>I22</u> .</p>

<b>I16 CHECK CIRCUIT 1570 (TN/BK) FOR AN OPEN BETWEEN THE OCSM AND THE PRESSURE SENSOR</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between OCSM C3043-4, circuit 1570 (TN/BK), harness side and OCS pressure sensor C3042-2, circuit 1570 (TN/BK), harness side.</li> </ul>  <p>N0003713</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>I17</u> .</p> <p><b>No</b> REPAIR circuit 1570 (TN/BK). GO to <u>I22</u> .</p>
<b>I17 CHECK FOR A SHORT BETWEEN CIRCUITS 1568 (RD/WH), 1569 (GY/LB) AND 1570 (TN/BK)</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between OCS pressure sensor: <ul style="list-style-type: none"> <li>◆ C3042-1, circuit 1568 (RD/WH), harness side and C3042-2, circuit 1570 (TN/BK), harness side.</li> <li>◆ C3042-1, circuit 1568 (RD/WH), harness side and C3042-3, circuit 1569 (GY/LB), harness side.</li> <li>◆ C3042-2, circuit 1570 (TN/BK), harness side and C3042-3, circuit 1569 (GY/LB), harness side.</li> </ul> </li> </ul>  <p>N0080718</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>I18</u> .</p> <p><b>No</b> REPAIR circuit 1568 (RD/WH), 1569 (GY/LB) and/or 1570 (TN/BK). GO to <u>I22</u> .</p>
<b>I18 CHECK OCS SYSTEM</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors, OCS system components and the RCM electrical connector are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Install a new OCS system service kit. Refer to <u>Occupant Classification Sensor</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• ⚠ <b>WARNING:</b> Make sure the front passenger seat repair is complete, the seat and all attached components (head restraint, seat side shield, etc.) are correctly</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>I22</u> .</p> <p><b>No</b> Fault corrected. GO to <u>I22</u> .</p>

assembled, and the seat is correctly installed to the vehicle before carrying out the System Reset. Failure to follow these instructions may result in incorrect operation of the occupant classification system (OCS) and increases the risk of serious personal injury or death in a crash.


- **NOTICE:** To prevent system failure, it is necessary to carry out the OCS system reset when a front passenger seat cushion is disassembled, a new trim cover installed or an OCS system service kit is installed. A scan tool is used to carry out the OCS system reset.
- **NOTICE:** To prevent system failure, the following precautions must be taken before carrying out the OCS system reset:
  - ◆ Make sure the voltage to the OCSM is above 8.0 volts and less than 18.0 volts.
  - ◆ Make sure the OCS system is not at a temperature below 6°C (42°F) or above 36°C (97°F) when initiating the OCS system reset process. If the vehicle has been exposed to extreme cold or hot temperatures, the vehicle must be exposed and kept at a temperature within the limits, 6°C to 36°C (42°F to 97°F) for a minimum of 30 minutes.
  - ◆ Make sure nothing is present on the passenger seat before carrying out the OCS system reset and nothing is placed on the seat during the process.
  - ◆ Make sure a minimum 8-second time period has passed after cycling the ignition ON before the carrying out the OCS system reset process.

**Carry out the OCS system reset.**

- If the first system reset attempt was unsuccessful, carry out a thorough inspection of the following and repair any concerns found.
  - ◆ OCS system connector and wiring for damage
  - ◆ Pressure sensor hose for kinks and/or damage
  - ◆ Seat-related wiring harness and body wiring harness terminals and connectors for damage
- Carry out a second OCS system reset. If the second attempt is unsuccessful, install a new OCS system service kit. For additional information, refer to OCS in this section
- Ignition OFF.
- **NOTE:** The ignition must be cycled after the OCS system reset.
- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self Test - RCM .
- Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2290 Fault PIDs.
  - ◆ Refer to PID list in Normal Operation to view 2290 fault PIDs.
- **Do any 2290 fault PIDs indicate a fault?**

I19 CHECK FOR AN OCSM MOUNTING FAULT	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• <b>NOTE:</b> The OCSM must be correctly positioned and securely fastened in place. Failure to do so can set a DTC in the RCM .</li> <li>• Inspect the OCSM for correct mounting location and direction, that the OCSM fasteners are tight, no damage to the OCSM and no damage to the seat cushion frame.</li> <li>• Inspect the OCSM for correct mounting location and direction, that the OCSM fasteners are tight, no damage to the OCSM and no damage to the seat cushion frame.</li> <li>• <b>Is the OCSM correctly located and are the fasteners tight and is there no damage to components?</b></li> </ul>	<p><b>Yes</b> INSTALL a new OCS system service kit. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>I21</u> .</p> <p><b>No</b> REPAIR as necessary. REFER to <u>Occupant Classification Sensor</u> in this section for correct mounting location/direction of the OCSM and the correct fasteners for mounting of the OCSM . If the seat cushion frame is damaged, REFER to the appropriate procedure in <u>Section 501-10</u> for repair. GO to <u>I22</u> .</p>
I20 CHECK OCS SYSTEM - CALIBRATION FAULT	
<p><b>NOTE:</b> When a calibration fault is present, <b>carry out</b> the OCS system reset before installing a service kit.</p> <p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors, OCS system components and the RCM electrical connector are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>⚠ WARNING:</b> Make sure the front passenger seat repair is complete, the seat and all attached components (head restraint, seat side shield, etc.) are correctly assembled, and the seat is correctly installed to the vehicle before carrying out the System Reset. Failure to follow these instructions may result in incorrect operation of the occupant classification system (OCS) and increases the risk of serious personal injury or death in a crash.</li> <li>• <b>NOTICE:</b> To prevent system failure, the following precautions must be taken before carrying out the Occupant Classification System (OCS) system reset: <ul style="list-style-type: none"> <li>♦ Make sure the voltage to the Occupant Classification System Module (OCSM) is above 8.0 volts and less than 18.0 volts.</li> <li>♦ Make sure the OCS system is not at a temperature below 6°C (42°F) or above 36°C (97°F) when initiating the OCS system reset process. If the vehicle has been exposed to extreme cold or hot temperatures, the vehicle must be exposed and kept at a temperature within the limits, 6°C to 36°C (42°F to 97°F) for a minimum of 30 minutes.</li> <li>♦ Make sure nothing is present on the passenger seat before carrying out the OCS system reset and nothing is placed on the seat during the</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new OCS system service kit. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>I22</u> .</p> <p><b>No</b> Fault corrected. GO to <u>I22</u> .</p>

<p><b>process.</b></p> <ul style="list-style-type: none"> <li>◆ <b>Make sure a minimum 8-second time period has passed after cycling the ignition ON before the carrying out the OCS system reset process.</b></li> <li>• <b>NOTE:</b> If the first attempt to carry out the OCS system reset is unsuccessful, a second attempt must be made. If the second attempt to carry out the OCS system reset is unsuccessful a second time, a new OCS system service kit must be installed.</li> <li>• Carry out the OCS system reset.</li> <li>• Ignition OFF.</li> <li>• <b>NOTE:</b> The ignition must be cycled after the OCS system reset.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2290 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2290 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2290 fault PIDs indicate a fault?</b></li> </ul>	
<b>I21 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2290 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2290 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2290 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b></p> <p>The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p><b>Vehicles with a production OCS system</b></p> <p>For 2290_26_OD ( OCS Communications Fault, Front Pass. side) ( LFC 1-6), GO to <u>I2</u> .</p> <p>For 2290_28_OD (Occupant Classification Sensor Mounting Fault, Front Passenger Side) ( LFC 11-11), GO to <u>I19</u> .</p> <p>For 2290_27_OD (Generic OCS Module Fault, Front Pass. side) ( LFC 11-8), INSTALL a new OCS system service kit. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>I21</u> .</p> <p>For 2290_25_OD ( OCS Calibration Fault, Front Pass. side) ( LFC 11-9),</p>

	<p>GO to <u>I20</u> .</p> <p>For 2290_24_OD ( OCS Sensing Element Fault, Front Pass. side) ( LFC 11-10), GO to <u>I11</u> .</p> <p><b>Vehicles with a OCS system service kit</b></p> <p>For 2290_26_OD ( OCS Communications Fault, Front Pass. side) ( LFC 1-6), GO to <u>I2</u> .</p> <p>For 2290_27_OD (Generic OCS Module Fault, Front Pass. side) ( LFC 11-8), INSTALL a new OCS system service kit. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>I21</u> .</p> <p>For 2290_25_OD ( OCS Calibration Fault, Front Pass. side) ( LFC 11-9), GO to <u>I20</u> .</p> <p>For 2290_24_OD ( OCS Sensing Element Fault, Front Pass. side) ( LFC 11-10), INSTALL a new OCS system service kit. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>I21</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>I22</u> .</p>
<b>I22 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p>

<ul style="list-style-type: none"> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.
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### Pinpoint Test J: DTC B2292

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Codes (LFCs) indicate the specific fault PIDs associated with DTC B2292:

LFC	Description	LFC	Description
3-3	Driver Pretensioner Open/High Resistance Fault	9-7	Driver Pretensioner Short to Battery Fault
3-4	Passenger Pretensioner Open/High Resistance Fault	9-8	Passenger Pretensioner Short to Battery Fault
9-3	Driver Pretensioner Short to Ground Fault	9-11	Driver Pretensioner Low Resistance Fault
9-4	Passenger Pretensioner Short to Ground Fault	9-12	Passenger Pretensioner Low Resistance Fault

#### Normal Operation

The safety belt retractor pretensioners are activated by the Restraints Control Module (RCM) to remove excessive slack from the safety belt webbing when an impact exceeding preprogrammed limits is detected.

The RCM checks all of the safety belt retractor pretensioners for faults. If the RCM detects one of the following faults on any of the safety belt retractor pretensioner circuits, it will store DTC B2292 in memory and, depending on the fault, flash a LFC on the air bag warning indicator.

Fault PIDs <sup>a</sup>	Description	Fault Trigger Condition
2292_24_OD and 2292_24_CM	Pretensioner Circuit Short to Ground, Front Passenger Side	When the Restraints Control Module (RCM) senses a short to ground on either passenger safety belt retractor pretensioner circuit, a fault will be indicated.
2292_25_OD and 2292_25_CM	Pretensioner Circuit Short to Battery, Front Passenger Side	When the RCM senses a short to voltage on either passenger safety belt retractor pretensioner circuit, a fault will be indicated.
2292_26_OD and 2292_26_CM	Pretensioner Circuit Open, Front Passenger Side	When the RCM measures resistance greater than 5 ohms between the passenger safety belt retractor pretensioner



		circuits, a fault will be indicated.
2292_27_OD and 2292_27_CM	Pretensioner Circuit Resistance Low, Front Passenger Side	When the RCM measures resistance less than 0.9 ohm between the passenger safety belt retractor pretensioner circuits, a fault will be indicated.
2292_28_OD and 2292_28_CM	Pretensioner Circuit Short to Ground, Front Driver Side	When the RCM senses a short to ground on either driver safety belt retractor pretensioner circuit, a fault will be indicated.
2292_29_OD and 2292_29_CM	Pretensioner Circuit Short to Battery, Front Driver Side	When the RCM senses a short to voltage on either driver safety belt retractor pretensioner circuit, a fault will be indicated.
2292_30_OD and 2292_30_CM	Pretensioner Circuit Open, Front Driver Side	When the RCM measures resistance greater than 5 ohms between the driver safety belt retractor pretensioner circuits, a fault will be indicated.
2292_31_OD and 2292_31_CM	Pretensioner Circuit Resistance Low, Front Driver Side	When the RCM measures resistance less than 0.9 ohm between the driver safety belt retractor pretensioner circuits, a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2292. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC B2292.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Pretensioner
- RCM

**PINPOINT TEST J: DTC B2292**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

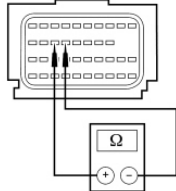
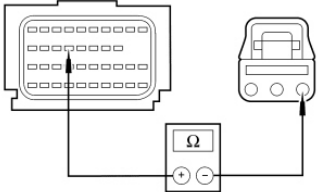
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

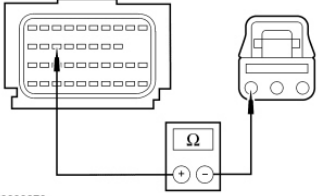
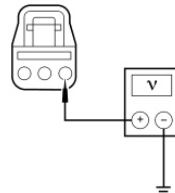
**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

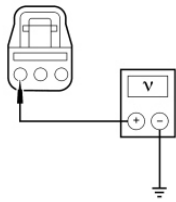
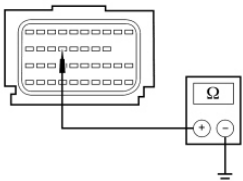
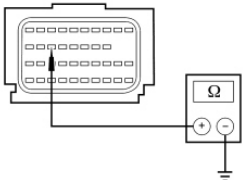
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

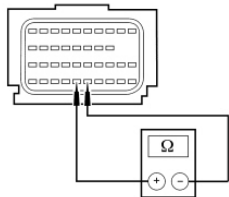
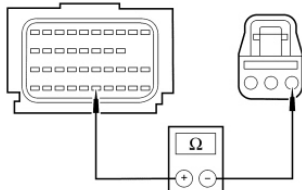
Test Step	Result / Action to Take
<b>J1 RETRIEVE SRS DTCs</b>	

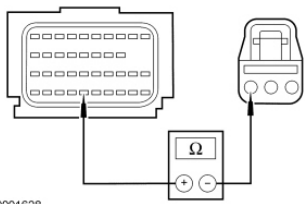
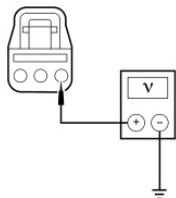
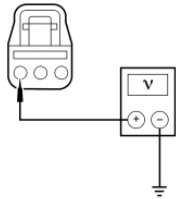
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2292 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2292 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2292 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>J2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>J18</u> .</p>
<p><b>J2 CHECK THE SAFETY BELT RETRACTOR PRETENSIONER</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: The affected Safety Belt Retractor Pretensioner C3014 (Driver) or C303 (Passenger).</li> <li>• Connect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013) to the affected Safety Belt Retractor Pretensioner C3014 (Driver) or C303 (Passenger).</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2292 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2292 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2292 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test.</p> <p>Using the fault PIDs recorded in Step J1, GO to the appropriate pinpoint test step.</p> <p>For 2292_31_OD (Pretensioner Circuit Resistance Low, Front Driver Side) ( LFC 9-11), GO to <u>J3</u> .</p> <p>For 2292_30_OD (Pretensioner Circuit Open, Front Driver Side) ( LFC 3-3), GO to <u>J4</u> .</p> <p>For 2292_29_OD (Pretensioner Circuit Short to Battery, Front Driver Side) ( LFC 9-7), GO to <u>J6</u> .</p> <p>For 2292_28_OD (Pretensioner Circuit Short to Ground, Front Driver Side) ( LFC 9-3), GO to <u>J8</u> .</p> <p>For 2292_24_OD (Pretensioner Circuit Short to Ground, Front Passenger Side) ( LFC 9-12), GO to <u>J10</u> .</p> <p>For 2292_26_OD (Pretensioner Circuit Open, Front Passenger Side) ( LFC 3-4), GO to <u>J11</u> .</p> <p>For 2292_25_OD (Pretensioner Circuit Short to Battery, Front Passenger Side) ( LFC 9-8), GO to <u>J13</u> .</p> <p>For 2292_24_OD (Pretensioner Circuit Short to Ground, Front Passenger Side) ( LFC 9-4), GO to <u>J15</u> .</p> <p><b>No</b> INSTALL a new driver or passenger safety</p>

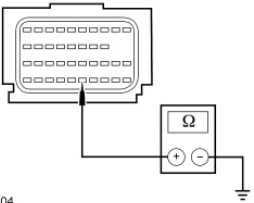
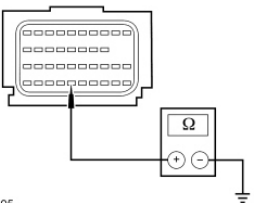
	belt retractor pretensioner. REFER to <u>Section 501-20A</u> . GO to <u>J19</u> .
<b>J3 CHECK FOR A SHORT BETWEEN DRIVER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS 1079 (LG/RD) AND 1080 (LG/BK)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013) .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-17, circuit 1079 (LG/RD), and C310b-18, circuit 1080 (LG/BK), harness side.</li> </ul>  <p>A0074757</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J17</u> .</p> <p><b>No</b> REPAIR circuits 1079 (LG/RD) and 1080 (LG/BK). GO to <u>J19</u> .</p>
<b>J4 CHECK CIRCUIT 1079 (LG/RD) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-17, circuit 1079 (LG/RD), harness side and driver safety belt retractor pretensioner C3014-1, circuit 1079 (LG/RD), harness side.</li> </ul>  <p>N0000872</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>J5</u> .</p> <p><b>No</b> REPAIR circuit 1079 (LG/RD). GO to <u>J19</u> .</p>
<b>J5 CHECK CIRCUIT 1080 (LG/BK) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-18, circuit 1080 (LG/BK), harness side and driver safety belt retractor pretensioner C3014-3, circuit 1080 (LG/BK), harness side.</li> </ul>  <p>N0000873</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>J17</u> .</p> <p><b>No</b> REPAIR circuit 1080 (LG/BK). GO to <u>J19</u> .</p>
<p><b>J6 CHECK CIRCUIT 1079 (LG/RD) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between driver safety belt retractor pretensioner C3014-1, circuit 1079 (LG/RD), harness side and ground.</li> </ul>  <p>N0000870</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1079 (LG/RD). GO to <u>J19</u> .</p> <p><b>No</b> GO to <u>J7</u> .</p>
<p><b>J7 CHECK CIRCUIT 1080 (LG/BK) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Measure the voltage between driver safety belt retractor pretensioner C3014-3, circuit 1080 (LG/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 1080 (LG/BK). GO to <u>J19</u> .</p> <p><b>No</b> GO to <u>J17</u> .</p>

 <p>N0000871</p> <p>• Is any voltage present?</p>	
<p><b>J8 CHECK CIRCUIT 1079 (LG/RD) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-17, circuit 1079 (LG/RD), harness side and ground.</li> </ul>  <p>A0074762</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>J9</u> .</p> <p><b>No</b> REPAIR circuit 1079 (LG/RD). GO to <u>J19</u> .</p>
<p><b>J9 CHECK CIRCUIT 1080 (LG/BK) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-18, circuit 1080 (LG/BK), harness side and ground.</li> </ul>  <p>A0074798</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>J17</u> .</p> <p><b>No</b> REPAIR circuit 1080 (LG/BK). GO to <u>J19</u> .</p>
<p><b>J10 CHECK FOR A SHORT BETWEEN PASSENGER SAFETY BELT RETRACTOR PRETENSIONER CIRCUITS 1081 (YE/RD) AND 1082 (LB/BK)</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-36, circuit 1082 (LB/BK), and C310b-35, circuit 1081 (YE/RD), harness side.</li> </ul>  <p>A0074799</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>J17</u> .</p> <p><b>No</b> REPAIR circuits 1081 (YE/RD) and 1082 (LB/BK). GO to <u>J19</u> .</p>
<p><b>J11 CHECK CIRCUIT 1081 (YE/RD) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-35, circuit 1081 (YE/RD), harness side and passenger safety belt retractor pretensioner C303-1, circuit 1081 (YE/RD), harness side.</li> </ul>  <p>N0000874</p> <p>• Is the resistance less than 0.5 ohm?</p>	<p><b>Yes</b> GO to <u>J12</u> .</p> <p><b>No</b> REPAIR circuit 1081 (YE/RD). GO to <u>J19</u> .</p>
<p><b>J12 CHECK CIRCUIT 1082 (LB/BK) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-36, circuit 1082 (LB/BK), harness side and passenger safety belt retractor pretensioner C303-3, circuit 1082 (LB/BK), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>J17</u> .</p> <p><b>No</b> REPAIR circuit 1082 (LB/BK). GO to <u>J19</u> .</p>

 <p>N0001628</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>J13 CHECK CIRCUIT 1081 (YE/RD) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between passenger safety belt retractor pretensioner C303-1, circuit 1081 (YE/RD), harness side and ground.</li> </ul>  <p>N0000870</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1081 (YE/RD). GO to <u>J19</u> .</p> <p><b>No</b> GO to <u>J14</u> .</p>
<p><b>J14 CHECK CIRCUIT 1082 (LB/BK) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Measure the voltage between passenger safety belt retractor pretensioner C303-3, circuit 1082 (LB/BK), harness side and ground.</li> </ul>  <p>N0000871</p>	<p><b>Yes</b> REPAIR circuit 1082 (LB/BK). GO to <u>J19</u> .</p> <p><b>No</b> GO to <u>J17</u> .</p>

<ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<b>J15 CHECK CIRCUIT 1081 (YE/RD) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-35, circuit 1081 (YE/RD), harness side and ground.</li> </ul>  <p>A0074804</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J16</u> .</p> <p><b>No</b> REPAIR circuit 1081 (YE/RD). GO to <u>J19</u> .</p>
<b>J16 CHECK CIRCUIT 1082 (LB/BK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-36, circuit 1082 (LB/BK), harness side and ground.</li> </ul>  <p>A0074805</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J17</u> .</p> <p><b>No</b> REPAIR circuit 1082 (LB/BK). GO to <u>J19</u> .</p>
<b>J17 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013) to the affected Safety Belt Retractor Pretensioner</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>J19</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b></p>



<p>C3014 (Driver) or C303 (Passenger).</p> <ul style="list-style-type: none"> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2292 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2292 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2292 fault PIDs indicate a fault?</b></li> </ul>	REPAIR any intermittent wiring, terminal or connector concerns found. GO to <u>J19</u> .
<b>J18 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: The affected Safety Belt Retractor Pretensioner C3014 (Driver) or C303 (Passenger).</li> <li>• Connect: Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013) to the affected Safety Belt Retractor Pretensioner C3014 (Driver) or C303 (Passenger).</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record 2292 Fault PIDs.</li> <li>• <b>Was DTC B2292 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b></p> <p>The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the self test. CHECK for causes of the intermittent fault at or near the affected safety belt retractor pretensioner electrical connector. REPAIR any intermittent wiring, terminal or connector concern found.</p> <p>If an intermittent concern <b>was</b> found and repaired, GO to <u>J19</u> .</p> <p>If an intermittent concern <b>was not</b> found and repaired, USE the fault PIDs recorded and GO to the appropriate pinpoint test step.</p> <p>For driver safety belt retractor pretensioner with a low resistance fault (2292_31_OD) ( LFC 9-11), GO to <u>J3</u> .</p> <p>For driver safety belt retractor pretensioner with an open circuit fault (2292_30_OD) ( LFC 3-3), GO to <u>J4</u> .</p> <p>For driver safety belt retractor pretensioner with a short to battery fault (2292_29_OD) ( LFC 9-7), GO to <u>J6</u> .</p> <p>For driver safety belt retractor pretensioner with a short to ground fault (2292_28_OD) ( LFC 9-3), GO to <u>J8</u> .</p> <p>For passenger safety belt retractor pretensioner with a low resistance fault (2292_24_OD) ( LFC 9-12), GO to <u>J10</u> .</p> <p>For passenger safety belt retractor pretensioner</p>

	<p>with an open circuit fault (2292_26_OD) (LFC 3-4), GO to <b>J11</b> .</p> <p>For passenger safety belt retractor pretensioner with a short to battery fault (2292_25_OD) (LFC 9-8), GO to <b>J13</b> .</p> <p>For passenger safety belt retractor pretensioner with a short to ground fault (2292_24_OD) (LFC 9-4), GO to <b>J15</b> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminal or connector concerns found. GO to <b>J19</b> .</p>
<b>J19 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test K: DTC B2293**

Refer to Wiring Diagrams Cell **46** , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Codes (LFCs) indicate the specific fault PIDs associated with DTC B2293:

<b>LFC</b>	<b>Description</b>	<b>LFC</b>	<b>Description</b>
1-9	Driver Air Bag Squib 1 Open/High Resistance Fault	8-7	Driver Air Bag Squib 1 Short to Battery Fault
2-1	Passenger Air Bag Squib 1 Open/High Resistance Fault	8-8	Driver Air Bag Squib 2 Short to Battery Fault
8-1	Driver Air Bag Squib 2 Open/High Resistance Fault	8-9	Passenger Air Bag Squib 1 Short to Battery Fault
8-2	Passenger Air Bag Squib 2 Open/High Resistance Fault	8-10	Passenger Air Bag Squib 2 Short to Battery Fault
8-3	Driver Air Bag Squib 1 Short to Ground Fault	8-11	Driver Air Bag Squib 1 Low Resistance Fault
8-4	Driver Air Bag Squib 2 Short to Ground Fault	8-12	Driver Air Bag Squib 2 Low Resistance Fault
8-5	Passenger Air Bag Squib 1 Short to Ground Fault	8-13	Passenger Air Bag Squib 1 Low Resistance Fault
8-6	Passenger Air Bag Squib 2 Short to Ground Fault	8-14	Passenger Air Bag Squib 2 Low Resistance Fault

### Normal Operation

The Restraints Control Module (RCM) monitors all front air bag module circuits for faults. The RCM will set a DTC if a short to battery or short to ground fault is detected. The RCM will also set a DTC if the loop resistance is less than 0.9 ohm or greater than 5.0 ohms. If the RCM detects a fault on any of the front air bag circuits, it will store DTC B2293 in memory and depending on the fault, flash a LFC on the air bag warning indicator.

<b>Fault PIDs <sup>a</sup></b>	<b>Description</b>	<b>Fault Trigger Condition</b>
2293_16_OD and 2293_16_CM	Air Bag Inflator Circuit Resistance Low - Loop No. 2, Front Passenger Side	When the Restraints Control Module (RCM) measures resistance less than 0.9 ohm between the passenger air bag loop circuits, a fault will be indicated.
2293_17_OD and 2293_17_CM	Air Bag Circuit Open - Loop No. 2, Front Passenger Side	When the RCM measures resistance greater than 5 ohms between the passenger air bag loop circuits, a fault will be indicated.
2293_18_OD and 2293_18_CM	Air Bag Circuit Short to Battery - Loop No. 2, Front Passenger Side	When the RCM senses a short to voltage on either passenger air bag loop circuit, a fault will be indicated.
2293_19_OD and 2293_19_CM	Air Bag Circuit Short to Ground - Loop No. 2, Front Passenger Side	When the RCM senses a short to ground on either passenger air bag loop circuit, a fault will be indicated.
2293_20_OD and 2293_20_CM	Air Bag Inflator Circuit Resistance Low - Loop No. 2, Front Driver Side	When the RCM measures resistance less than 0.9 ohm between the driver air bag loop circuits, a fault will be indicated.
2293_21_OD and 2293_21_CM	Air Bag Circuit Open - Loop No. 2, Front Driver Side	When the RCM measures resistance greater than 5 ohms between the driver air bag loop circuits, a fault will be indicated.
2293_22_OD and 2293_22_CM	Air Bag Circuit Short to Battery - Loop No. 2, Front Driver Side	When the RCM senses a short to voltage on either driver air bag loop circuit, a fault will be indicated.

2293_23_OD and 2293_23_CM	Air Bag Circuit Short to Ground - Loop No. 2, Front Driver Side	When the RCM senses a short to ground on either driver air bag loop circuit, a fault will be indicated.
2293_24_OD and 2293_24_CM	Air Bag Inflator Circuit Resistance Low - Loop No. 1, Front Passenger Side	When the RCM measures resistance less than 0.9 ohm between the passenger air bag loop circuits, a fault will be indicated.
2293_25_OD and 2293_25_CM	Air Bag Circuit Open - Loop No. 1, Front Passenger Side	When the RCM measures resistance greater than 5 ohms between the passenger air bag loop circuits, a fault will be indicated.
2293_26_OD and 2293_26_CM	Air Bag Circuit Short to Battery - Loop No. 1, Front Passenger Side	When the RCM senses a short to voltage on either passenger air bag loop circuit, a fault will be indicated.
2293_27_OD and 2293_27_CM	Air Bag Circuit Short to Ground - Loop No. 1, Front Passenger Side	When the RCM senses a short to ground on either passenger air bag loop circuit, a fault will be indicated.
2293_28_OD and 2293_28_CM	Air Bag Inflator Circuit Resistance Low - Loop No. 1, Front Driver Side	When the RCM measures resistance less than 0.9 ohm between the driver air bag loop circuits, a fault will be indicated.
2293_29_OD and 2293_29_CM	Air Bag Circuit Open - Loop No. 1, Front Driver Side	When the RCM measures resistance greater than 5 ohms between the driver air bag loop circuits, a fault will be indicated.
2293_30_OD and 2293_30_CM	Air Bag Circuit Short to Battery - Loop No. 1, Front Driver Side	When the RCM senses a short to voltage on either driver air bag loop circuit, a fault will be indicated.
2293_31_OD and 2293_31_CM	Air Bag Circuit Short to Ground - Loop No. 1, Front Driver Side	When the RCM senses a short to ground on either driver air bag loop circuit, a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2293. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC B2293.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Clockspring
- Driver/Passenger air bag module
- RCM

**PINPOINT TEST K: DTC B2293**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

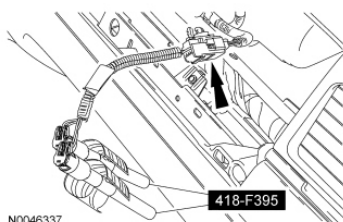
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE: SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .**

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>K1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2293 Fault PIDs. <ul style="list-style-type: none"> <li>Refer to PID list in Normal Operation to view 2293 fault PIDs.</li> </ul> </li> <li><b>Do any 2293 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <b>K2</b> .</p> <p><b>No</b> This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to <b>K38</b> .</p>
<b>K2 CHECK THE DRIVER AND PASSENGER AIR BAG MODULES</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>If the fault was reported for the driver air bag module: <ul style="list-style-type: none"> <li>Remove the driver air bag module. Refer to <u>Driver Air Bag Module</u> in this section.</li> <li>Connect restraint system diagnostic tools 418-F395 (2 required) to the driver air bag module loop 1 and loop 2 connectors.</li> </ul> </li> <li><b>NOTE:</b> Detach and disconnect the passenger air bag module jumper harness and connect the restraint system diagnostic tools, refer to <u>Supplemental Restraint System (SRS) Deactivation and Reactivation</u> in this section.</li> <li>If the fault was reported for the passenger air bag module: <ul style="list-style-type: none"> <li>Remove the passenger air bag module. Refer to <u>Passenger Air Bag Module</u> in this section.</li> <li>Remove and disconnect the passenger air bag module jumper harness from the passenger air bag module.</li> </ul> </li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded in the Step K1, GO to the appropriate pinpoint test step.</p> <p>For 2293_31_OD (Air Bag Circuit Short to Ground - Loop No. 1, Front Driver Side) ( LFC 8-3), GO to <b>K3</b> .</p> <p>For 2293_30_OD (Air Bag Circuit Short to Battery - Loop No. 1, Front Driver Side) ( LFC 8-7), GO to <b>K5</b> .</p> <p>For 2293_29_OD (Air Bag Circuit Open - Loop No. 1, Front Driver Side) ( LFC 1-9), GO to <b>K7</b> .</p> <p>For 2293_28_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 1, Front Driver Side) ( LFC 8-11), GO to <b>K11</b> .</p> <p>For 2293_27_OD (Air Bag Circuit Short to Ground - Loop No. 1, Front Passenger Side) ( LFC 8-5), GO to <b>K14</b> .</p> <p>For 2293_26_OD (Air Bag Circuit Short to Battery - Loop No. 1, Front Passenger Side) ( LFC 8-9), GO to <b>K15</b> .</p> <p>For 2293_25_OD (Air Bag Circuit Open - Loop No.</p>

- ◆ Connect restraint system diagnostic tools 418-F395 (2 required) to the passenger air bag module jumper harness electrical connectors.
- ◆ Connect the passenger air bag module jumper harness with restraint system diagnostic tools to passenger air bag module C256.



- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2293 Fault PIDs.
  - ◆ Refer to PID list in Normal Operation to view 2293 fault PIDs.
- **Do any 2293 fault PIDs indicate a fault?**

1, Front Passenger Side) ( LFC 2-1), GO to K16 .

For 2293\_24\_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 1, Front Passenger Side) ( LFC 8-13), GO to K18 .

For 2293\_23\_OD (Air Bag Circuit Short to Ground - Loop No. 2, Front Driver Side) ( LFC 8-4), GO to K20 .

For 2293\_22\_OD (Air Bag Circuit Short to Battery - Loop No. 2, Front Driver Side) ( LFC 8-8), GO to K22 .

For 2293\_21\_OD (Air Bag Circuit Open - Loop No. 2, Front Driver Side) ( LFC 8-1), GO to K24 .

For 2293\_20\_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 2, Front Driver Side) ( LFC 8-12), GO to K28 .

For 2293\_19\_OD (Air Bag Circuit Short to Ground - Loop No. 2, Front Passenger Side) ( LFC 8-6), GO to K31 .

For 2293\_18\_OD (Air Bag Circuit Short to Battery - Loop No. 2, Front Passenger Side) ( LFC 8-10), GO to K32 .

For 2293\_17\_OD (Air Bag Circuit Open - Loop No. 2, Front Passenger Side) ( LFC 8-2), GO to K33 .

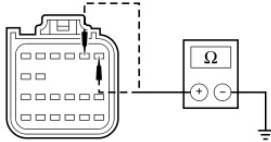
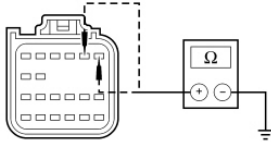
For (2293\_16\_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 2, Front Passenger Side) ( LFC 8-14), GO to K35 .

**No**

If a fault was against the driver air bag module in Step K1, INSTALL a new driver air bag module. REFER to Driver Air Bag Module in this section. GO to K39 .

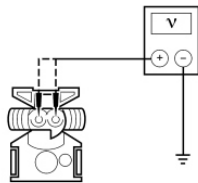
If a fault was against the passenger air bag module in Step K1, INSTALL a new passenger air bag module. REFER to Passenger Air Bag Module in this section. GO to K39 .

**K3 CHECK CIRCUITS 614 (GY/OG) AND 615 (GY/WH) FOR A SHORT TO GROUND BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP**

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: Driver Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>◆ RCM C310a-1, circuit 614 (GY/OG), harness side and ground.</li> <li>◆ RCM C310a-2, circuit 615 (GY/WH), harness side and ground.</li> </ul> </li> </ul>  <p>A0041212</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> GO to <u>K4</u> .</p>
<p><b>K4 CHECK CIRCUITS 614 (GY/OG) AND 615 (GY/WH) FOR A SHORT TO GROUND BETWEEN THE RCM AND CLOCKSPrING</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>◆ RCM C310a-1, circuit 614 (GY/OG), harness side and ground.</li> <li>◆ RCM C310a-2, circuit 615 (GY/WH), harness side and ground.</li> </ul> </li> </ul>  <p>A0041212</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p> <p><b>No</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 614 (GY/OG) or 615 (GY/WH). GO to <u>K39</u> .</p>
<p><b>K5 CHECK CIRCUITS 614 (GY/OG) AND 615 (GY/WH) FOR A SHORT TO VOLTAGE</b></p>	

# **BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP 1**

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Driver Air Bag Module Loop 1 Restraint System Diagnostic Tool.
- Disconnect: RCM C310a and C310b.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Measure the voltage between driver air module loop 1 electrical connector, pin 1, harness side and ground; and between driver air module loop 1 electrical connector, pin 2, harness side and ground.



A0088715

- **Is voltage present on either circuit?**

**Yes**  
GO to K6 .

**No**  
GO to K37 .

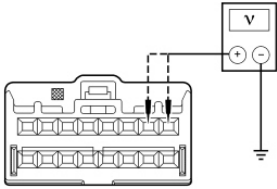
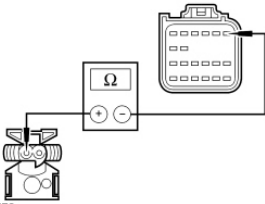
## **K6 CHECK CIRCUITS 614 (GY/OG) AND 615 (GY/WH) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND CLOCKSPring**

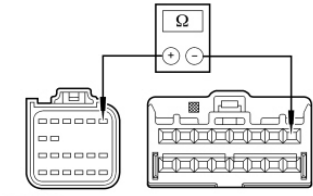
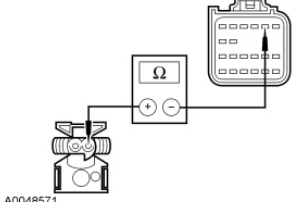
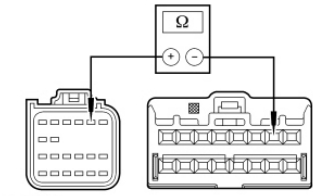
- Ignition OFF.
- Disconnect: Clockspring C218a.
- **NOTE:** Remove the steering column lower shroud to access clockspring C218a.
- Ignition ON.
- Measure the voltage between clockspring C218a-1, circuit 614 (GY/OG), harness side and ground; and between clockspring C218a-2, circuit 615 (GY/WH), harness side and ground.

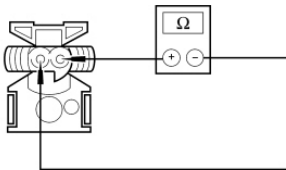
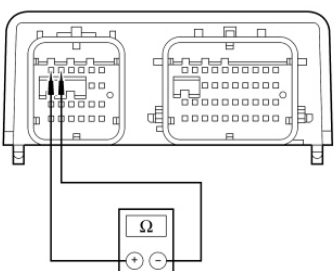
**Yes**  
Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 614 (GY/OG) or 615 (GY/WH). GO to K39 .

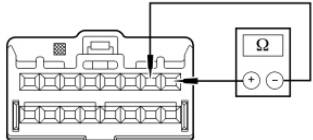
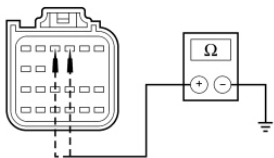
**No**  
INSTALL a new clockspring. REFER to Clockspring in this section. GO to K39 .

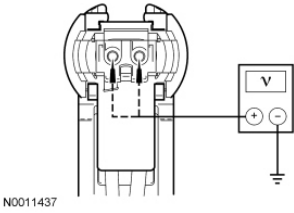


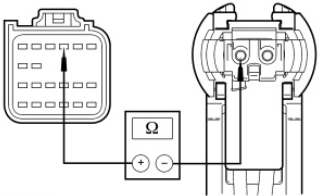
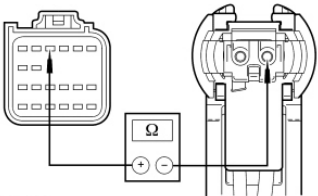
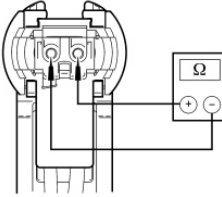
 <p>N0001643</p> <p>• Is voltage present on either circuit?</p>	
<p><b>K7 CHECK CIRCUIT 614 (GY/OG) FOR AN OPEN BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP 1</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a-1, circuit 614 (GY/OG), harness side and driver air bag module loop 1 electrical connector pin 1, harness side.</li> </ul>  <p>A0048570</p> <p>• Is the resistance less than 0.5 ohm?</p>	<p><b>Yes</b> GO to <u>K9</u> .</p> <p><b>No</b> GO to <u>K8</u> .</p>
<p><b>K8 CHECK CIRCUIT 614 (GY/OG) FOR AN OPEN BETWEEN THE RCM AND CLOCKSPRING</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between RCM C310a-1, circuit 614 (GY/OG), harness side and clockspring C218a-1, circuit 614 (GY/OG), harness side.</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p> <p><b>No</b> REPAIR circuit 614 (GY/OG). GO to <u>K39</u> .</p>

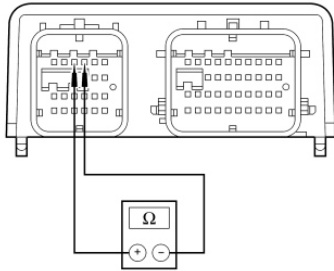
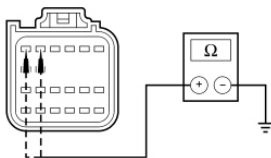
 <p>N0000864</p> <p>• Is the resistance less than 0.5 ohm?</p>	
<p><b>K9 CHECK CIRCUIT 615 (GY/WH) FOR AN OPEN BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP 1</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310a-2, circuit 615 (GY/WH), harness side and driver air bag module loop 1 electrical connector, pin 2, harness side.</li> </ul>  <p>A0048571</p> <p>• Is the resistance less than 0.5 ohm?</p>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> GO to <u>K10</u> .</p>
<p><b>K10 CHECK CIRCUIT 615 (GY/WH) FOR AN OPEN BETWEEN THE RCM AND CLOCKSPrING</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between RCM C310a-2, circuit 615 (GY/WH), harness side and clockspring C218a-2, circuit 615 (GY/WH), harness side.</li> </ul>  <p>N0000865</p> <p>• Is the resistance less than 0.5 ohm?</p>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p> <p><b>No</b> REPAIR circuit 615 (GY/WH). GO to <u>K39</u> .</p>
<p><b>K11 CHECK FOR A SHORT BETWEEN DRIVER AIR BAG MODULE LOOP 1 CIRCUITS 614 (GY/OG) AND 615 (GY/WH)</b></p>	

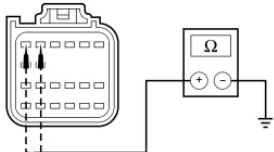
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Measure the resistance between driver air bag module loop 1 electrical connector, pin 1, harness side and pin 2, harness side.</li> </ul>  <p>A0030492</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K12</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>
<p><b>K12 CHECK THE RCM FOR LOW RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a pins 1 and 2, component side.</li> </ul>  <p>A0041266</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> GO to <u>K13</u> .</p>
<p><b>K13 CHECK FOR A SHORT BETWEEN CIRCUITS 614 (GY/OG) AND 615 (GY/WH)</b></p>	
<ul style="list-style-type: none"> <li>• Connect: RCM C310a and C310b.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Disconnect: Clockspring C218a.</li> </ul>	<p><b>Yes</b> REPAIR circuits 614 (GY/OG) and 615 (GY/WH). GO to <u>K39</u> .</p> <p><b>No</b> INSTALL a new clockspring. REFER to <u>Clockspring</u></p>

<ul style="list-style-type: none"> <li>• Measure the resistance between clockspring C218a-1, circuit 614 (GY/OG) harness side and C218a-2, circuit 615 (GY/WH), harness side.</li> </ul>  <p>N0000856</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 800 ohms?</b></li> </ul>	<p>in this section. GO to <u>K39</u> .</p>
<p><b>K14 CHECK CIRCUITS 607 (LB/OG) AND 616 (PK/BK) FOR A SHORT TO GROUND BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 1</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>♦ RCM C310a-3, circuit 607 (LB/OG), harness side and ground.</li> <li>♦ RCM C310a-4, circuit 616 (PK/BK), harness side and ground.</li> </ul> </li> </ul>  <p>A0041267</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 607 (LB/OG) or 616 (PK/BK). GO to <u>K39</u> .</p>
<p><b>K15 CHECK CIRCUITS 607 (LB/OG) AND 616 (PK/BK) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 1</b></p>	

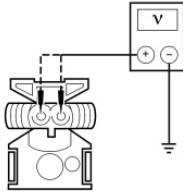
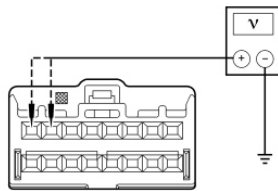
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between passenger air bag module loop 1 electrical connector, circuit 607 (LB/OG), harness side and ground; and between passenger air bag module loop 1 electrical connector, circuit 616 (PK/BK), harness side and ground.</li> </ul>  <p>N0011437</p>	<p><b>Yes</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 607 (LB/OG) or 616 (PK/BK). GO to <u>K39</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>
<p><b>K16 CHECK CIRCUIT 607 (LB/OG) FOR AN OPEN BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 1</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b .</li> <li>• Measure the resistance between RCM C310a-3, circuit 607 (LB/OG), harness side and passenger air bag module loop 1 electrical connector, circuit 607 (LB/OG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>K17</u> .</p> <p><b>No</b> REPAIR circuit 607 (LB/OG). GO to <u>K39</u> .</p>

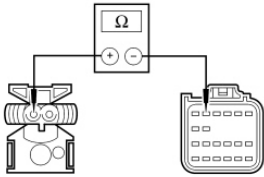
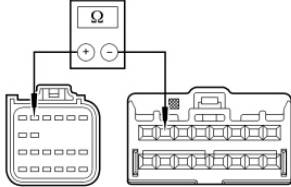
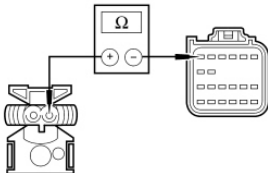
 <p>N0011438</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<b>K17 CHECK CIRCUIT 616 (PK/BK) FOR AN OPEN BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 1</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310a-4, circuit 616 (PK/BK), harness side and passenger air bag module loop 1 electrical connector, circuit 616 (PK/BK), harness side.</li> </ul>  <p>N0011439</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> REPAIR circuit 616 (PK/BK). GO to <u>K39</u> .</p>
<b>K18 CHECK FOR A SHORT BETWEEN PASSENGER AIR BAG MODULE LOOP 1 CIRCUITS 607 (LB/OG) AND 616 (PK/BK)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 1 Restraint System Diagnostic Tool.</li> <li>• Measure the resistance between passenger air bag module loop 1 electrical connector, circuit 607 (LB/OG), and circuit 616 (PK/BK), harness side.</li> </ul>  <p>N0011440</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K19</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>

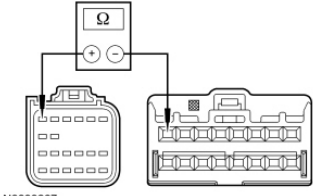
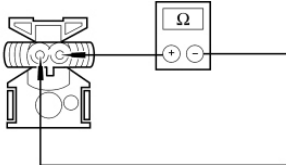
<b>K19 CHECK THE RCM FOR LOW RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a pins 3 and 4, component side.</li> </ul>  <p>A0041271</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> REPAIR circuits 607 (LB/OG) and 616 (PK/BK). GO to <u>K39</u> .</p>
<b>K20 CHECK CIRCUITS 1516 (YE/WH) AND 1517 (RD/OG) FOR A SHORT TO GROUND BETWEEN THE RCM AND DRIVER AIR BAG MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: Driver Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>♦ RCM C310a-5, circuit 1516 (YE/WH), harness side and ground.</li> <li>♦ RCM C310a-6, circuit 1517 (RD/OG), harness side and ground.</li> </ul> </li> </ul>  <p>A0041272</p>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> GO to <u>K21</u> .</p>

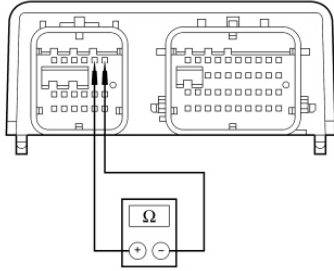
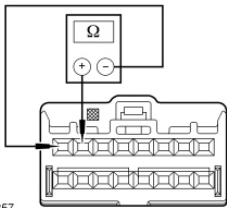
<ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	
<b>K21 CHECK CIRCUITS 1516 (YE/WH) AND 1517 (RD/OG) FOR A SHORT TO GROUND BETWEEN THE RCM AND CLOCKSPrING</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between:             <ul style="list-style-type: none"> <li>◆ RCM C310a-5, circuit 1516 (YE/WH), harness side and ground.</li> <li>◆ RCM C310a-6, circuit 1517 (RD/OG), harness side and ground.</li> </ul> </li> </ul>  <p>A0041272</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p> <p><b>No</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 1516 (YE/WH) or 1517 (RD/OG). GO to <u>K39</u> .</p>
<b>K22 CHECK CIRCUITS 1516 (YE/WH) AND 1517 (RD/OG) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP 2</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between driver air bag module loop 2 electrical connector, pin 1, harness side and ground; and between driver air bag module loop 2, pin 2, harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>K23</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>

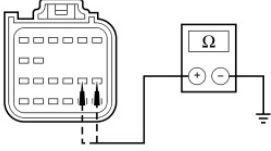


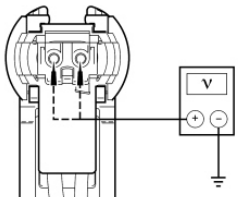
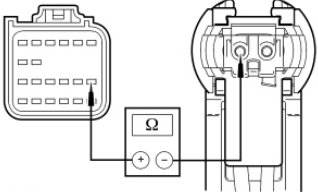
 <p>A0094162</p> <p>• Is voltage present on either circuit?</p>	
<p><b>K23 CHECK CIRCUITS 1516 (YE/WH) AND 1517 (RD/OG) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND CLOCKSPRING</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between clockspring C218a-7, circuit 1516 (YE/WH), harness side and ground; and between clockspring C218a-8, circuit 1517 (RD/OG), harness side and ground.</li> </ul>  <p>N0001644</p> <p>• Is voltage present on either circuit?</p>	<p><b>Yes</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 1516 (YE/WH) or 1517 (RD/OG). GO to <u>K39</u> .</p> <p><b>No</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p>
<p><b>K24 CHECK CIRCUIT 1516 (YE/WH) FOR AN OPEN BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP 2</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a-5, circuit 1516 (YE/WH), harness side and driver air bag module loop 2 electrical connector, pin 1, harness side.</li> </ul>	<p><b>Yes</b> GO to <u>K26</u> .</p> <p><b>No</b> GO to <u>K25</u> .</p>

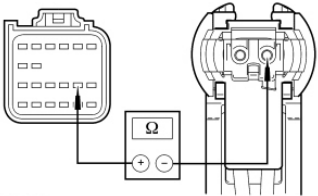
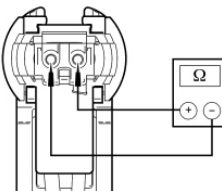
 <p>A0049606</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>K25 CHECK CIRCUIT 1516 (YE/WH) FOR AN OPEN BETWEEN THE RCM AND CLOCKSPRING</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between RCM C310a-5, circuit 1516 (YE/WH), harness side and clockspring C218a-7, circuit 1516 (YE/WH), harness side.</li> </ul>  <p>N0000866</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p> <p><b>No</b> REPAIR circuit 1516 (YE/WH). GO to <u>K39</u> .</p>
<p><b>K26 CHECK CIRCUIT 1517 (RD/OG) FOR AN OPEN BETWEEN THE RCM AND DRIVER AIR BAG MODULE LOOP 2</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310a-6, circuit 1517 (RD/OG), harness side and driver air bag module loop 2 electrical connector, pin 2, harness side.</li> </ul>  <p>A0049605</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> GO to <u>K27</u> .</p>
<p><b>K27 CHECK CIRCUIT 1517 (RD/OG) FOR AN OPEN BETWEEN THE RCM AND CLOCKSPRING</b></p>	

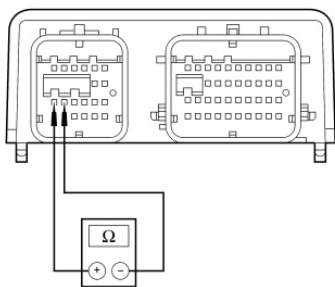
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between RCM C310a-6, circuit 1517 (RD/OG), harness side and clockspring C218a-8, circuit 1517 (RD/OG), harness side.</li> </ul>  <p>N0000867</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p> <p><b>No</b> REPAIR circuit 1517 (RD/OG). GO to <u>K39</u> .</p>
<p><b>K28 CHECK FOR A SHORT BETWEEN DRIVER AIR BAG MODULE LOOP 2 CIRCUITS 1516 (YE/WH) AND 1517 (RD/OG)</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Measure the resistance between driver air bag module loop 2 electrical connector, pin 1, harness side and pin 2, harness side.</li> </ul>  <p>A0030495</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K29</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>
<p><b>K29 CHECK THE RCM FOR LOW RESISTANCE</b></p>	

<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a pins 5 and 6, component side.</li> </ul>  <p>A0041276</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> GO to <u>K30</u> .</p>
<p><b>K30 CHECK FOR A SHORT BETWEEN CIRCUITS 1516 (YE/WH) AND 1517 (RD/OG)</b></p>	
<ul style="list-style-type: none"> <li>• Connect: RCM C310a and C310b.</li> <li>• Disconnect: Clockspring C218a.</li> <li>• <b>NOTE:</b> Remove the steering column lower shroud to access clockspring C218a.</li> <li>• Measure the resistance between clockspring C218a-7, circuit 1516 (YE/WH), harness side and C218a-8, circuit 1517 (RD/OG), harness side.</li> </ul>  <p>N0000857</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> REPAIR circuits 1516 (YE/WH) and 1517 (RD/OG). GO to <u>K39</u> .</p> <p><b>No</b> INSTALL a new clockspring. REFER to <u>Clockspring</u> in this section. GO to <u>K39</u> .</p>
<p><b>K31 CHECK CIRCUITS 1518 (BK/WH) AND 1519 (LG/RD) FOR A SHORT TO GROUND BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 2</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 2 Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013).</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>◆ RCM C310a-13, circuit 1518 (BK/WH), harness side and ground.</li> <li>◆ RCM C310a-14, circuit 1519 (LG/RD), harness side and ground.</li> </ul> </li> </ul>  <p>A0041277</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 1518 (BK/WH) or 1519 (LG/RD). GO to <u>K39</u> .</p>
<p><b>K32 CHECK CIRCUITS 1518 (BK/WH) AND 1519 (LG/RD) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 2</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between passenger air bag module loop 2 electrical connector, circuit 1518 (BK/WH), harness side and ground; and between passenger air bag module loop 2 electrical connector, circuit 1519 (LG/RD), harness side and ground.</li> </ul>	<p><b>Yes</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bar. REPAIR circuit 1518 (BK/WH) or 1519 (LG/RD). GO to <u>K39</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>

 <p>N0011441</p> <p>• Is voltage present on either circuit?</p>	
<p><b>K33 CHECK CIRCUIT 1518 (BK/WH) FOR AN OPEN BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 2</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a-13, circuit 1518 (BK/WH), harness side and passenger air bag module loop 2 electrical connector, circuit 1518 (BK/WH), harness side.</li> </ul>  <p>N0011442</p> <p>• Is the resistance less than 0.5 ohm?</p>	<p><b>Yes</b> GO to <u>K34</u> .</p> <p><b>No</b> REPAIR circuit 1518 (BK/WH). GO to <u>K39</u> .</p>
<p><b>K34 CHECK CIRCUIT 1519 (LG/RD) FOR AN OPEN BETWEEN THE RCM AND PASSENGER AIR BAG MODULE LOOP 2</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310a-14, circuit 1519 (LG/RD), harness side and passenger air bag module loop 2 electrical connector, circuit 1519 (LG/RD), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> REPAIR circuit 1519 (LG/RD). GO to <u>K39</u> .</p>

 <p>N0011443</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>K35 CHECK FOR A SHORT BETWEEN PASSENGER AIR BAG MODULE LOOP 2 CIRCUITS 1518 (BK/WH) AND 1519 (LG/RD)</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Air Bag Module Loop 2 Restraint System Diagnostic Tool.</li> <li>• Measure the resistance between passenger air bag module loop 2 electrical connector, circuit 1518 (BK/WH), harness side and circuit 1519 (LG/RD), harness side.</li> </ul>  <p>N0011444</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K36</u> .</p> <p><b>No</b> GO to <u>K37</u> .</p>
<p><b>K36 CHECK THE RCM FOR LOW RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a pins 13 and 14, component side.</li> </ul>	<p><b>Yes</b> GO to <u>K37</u> .</p> <p><b>No</b> REPAIR circuits 1518 (BK/WH) and 1519 (LG/RD). GO to <u>K39</u> .</p>



A0041281

- Is the resistance less than 800 ohms?

**K37 CONFIRM THE RCM FAULT**

**NOTE:** Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Connect: Restraint System Diagnostic Tools.
- Connect: RCM C310a and C310b.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self Test - RCM .
- **Was DTC B2293 retrieved on-demand during self-test?**

**Yes**

INSTALL a new RCM . REFER to Restraints Control Module (RCM) in this section. GO to K39 .

**No**

CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. **Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminals or connector concerns found. GO to K39 .

**K38 CHECK FOR AN INTERMITTENT FAULT**

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- If the fault was reported for the driver air bag module:
  - ◆ Remove the driver air bag module. Refer to Driver Air Bag Module in this section.

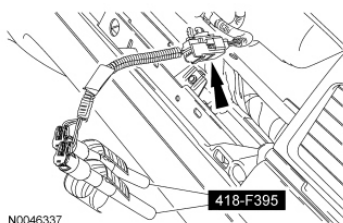
**Yes**

The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. CHECK for causes of the intermittent fault at or near the affected air bag module connector. REPAIR any intermittent wiring, terminals or connector concerns found.

If an intermittent concern **was** found and repaired, GO to K39 .



- ◆ Connect restraint system diagnostic tools 418-F395 (2 required) to the driver air bag module loop 1 and loop 2 connectors.
- **NOTE:** Detach and disconnect the passenger air bag module jumper harness and connect the restraint system diagnostic tools, refer to Supplemental Restraint System (SRS) Deactivation and Reactivation in this section.
- If the fault was reported for the passenger air bag module:
  - ◆ Remove the passenger air bag module. Refer to Passenger Air Bag Module in this section.
  - ◆ Disconnect and remove the passenger air bag module jumper harness from the passenger air bag module.
  - ◆ Connect restraint system diagnostic tools 418-F395 (2 required) to the passenger air bag module jumper harness electrical connectors.
  - ◆ Connect the passenger air bag module jumper harness with restraint system diagnostic tools to passenger air bag module C256.



- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self Test - RCM .
- Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2293 Fault PIDs.
  - ◆ Refer to PID list in Normal Operation to view 2293 fault PIDs.
- **Do any 2293 fault PIDs indicate a fault?**

If an intermittent concern **was not** found and repaired, USE the fault PIDs recorded and GO to the appropriate pinpoint test step.

For 2293\_31\_OD (Air Bag Circuit Short to Ground - Loop No. 1, Front Driver Side) ( LFC 8-3), GO to K3 .

For 2293\_30\_OD (Air Bag Circuit Short to Battery - Loop No. 1, Front Driver Side) ( LFC 8-7), GO to K5 .

For 2293\_29\_OD (Air Bag Circuit Open - Loop No. 1, Front Driver Side) ( LFC 1-9), GO to K7 .

For 2293\_28\_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 1, Front Driver Side) ( LFC 8-11), GO to K11 .

For 2293\_27\_OD (Air Bag Circuit Short to Ground - Loop No. 1, Front Passenger Side) ( LFC 8-5), GO to K14 .

For 2293\_26\_OD (Air Bag Circuit Short to Battery - Loop No. 1, Front Passenger Side) ( LFC 8-9), GO to K15 .

For 2293\_25\_OD (Air Bag Circuit Open - Loop No. 1, Front Passenger Side) ( LFC 2-1), GO to K16 .

For 2293\_24\_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 1, Front Passenger Side) ( LFC 8-13), GO to K18 .

For 2293\_23\_OD (Air Bag Circuit Short to Ground - Loop No. 2, Front Driver Side) ( LFC 8-4), GO to K20 .

For 2293\_22\_OD (Air Bag Circuit Short to Battery - Loop No. 2, Front Driver Side) ( LFC 8-8), GO to K22 .

For 2293\_21\_OD (Air Bag Circuit Open - Loop No. 2, Front Driver Side) ( LFC 8-1), GO to K24 .

For 2293\_20\_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 2, Front Driver Side) ( LFC 8-12), GO to K28 .

For 2293\_19\_OD (Air Bag Circuit Short to Ground - Loop No. 2, Front Passenger Side) ( LFC 8-6), GO to K31 .

	<p>For 2293_18_OD (Air Bag Circuit Short to Battery - Loop No. 2, Front Passenger Side) ( LFC 8-10), GO to <u>K32</u> .</p> <p>For 2293_17_OD (Air Bag Circuit Open - Loop No. 2, Front Passenger Side) ( LFC 8-2), GO to <u>K33</u> .</p> <p>For (2293_16_OD (Air Bag Inflator Circuit Resistance Low - Loop No. 2, Front Passenger Side) ( LFC 8-14), GO to <u>K35</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>K39</u> .</p>
<b>K39 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test L: DTC B2295**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Codes (LFCs) indicate the specific fault PIDs associated with DTC B2295:

LFC	Description	LFC	Description
2-2	Driver Seat Side Air Bag Open/High Resistance Fault	9-5	Driver Seat Side Air Bag Short to Battery Fault
2-3	Passenger Seat Side Air Bag Open/High Resistance Fault	9-6	Passenger Seat Side Air Bag Short to Battery Fault
9-1	Driver Seat Side Air Bag Short to Ground Fault	9-9	Driver Seat Side Air Bag Low Resistance Fault
9-2	Passenger Seat Side Air Bag Short to Ground Fault	9-10	Passenger Seat Side Air Bag Low Resistance Fault

### Normal Operation

A seat side air bag module provides protection of the thorax area (between the neck and abdomen) of the body. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.

The Restraints Control Module (RCM) monitors all seat side air bag module circuits for faults. The RCM will set a DTC if a short to battery, open or short to ground fault is detected. The RCM will also set a DTC if the loop resistance is less than 0.9 ohm or greater than 5.0 ohms. If the RCM detects one of the following faults on any of the seat side air bag circuits, it will store DTC B2295 in memory and, depending on the fault, flash a LFC on the air bag warning indicator.

Fault PIDs <sup>a</sup>	Description	Fault Trigger Condition
2295_24_OD and 2295_24_CM	Side Air Bag Circuit Resistance Low, Front Passenger Side	When the Restraints Control Module (RCM) measures resistance less than 0.9 ohm between the passenger side air bag module circuits, a fault will be indicated.
2295_25_OD and 2295_25_CM	Side Air Bag Circuit Open, Front Passenger Side	When the RCM measures resistance greater than 5 ohms between the passenger side air bag module circuits, a fault will be indicated.
2295_26_OD and 2295_26_CM	Side Air Bag Circuit Short to Ground, Front Passenger Side	When the RCM senses a short to ground on either passenger side air bag module circuit, a fault will be indicated.
2295_27_OD and 2295_27_CM	Side Air Bag Circuit Short to Battery, Front Passenger Side	When the RCM senses a short to voltage on either passenger side air bag module circuit, a fault will be indicated.
2295_28_OD and 2295_28_CM	Side Air Bag Circuit Resistance Low, Front Driver Side	When the RCM measures resistance less than 0.9 ohm between the driver side air bag module circuits, a fault will be indicated.
2295_29_OD and 2295_29_CM	Side Air Bag Circuit Open, Front Driver Side	When the RCM measures resistance greater than 5 ohms between the driver side air bag module circuits, a fault will be indicated.
2295_30_OD and 2295_30_CM	Side Air Bag Circuit Short to Ground, Front Driver Side	When the RCM senses a short to ground on either driver side air bag module circuit, a fault will be indicated.

2295_31_OD and 2295_31_CM	Side Air Bag Circuit Short to Battery, Front Driver Side	When the RCM senses a short to voltage on either driver side air bag module circuit, a fault will be indicated.
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<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2295. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC B2295.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Seat side air bag module
- RCM

#### PINPOINT TEST L: DTC B2295

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

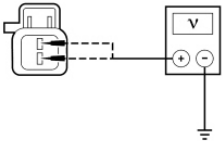
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

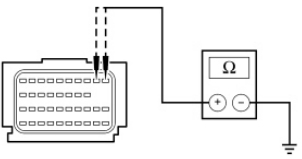
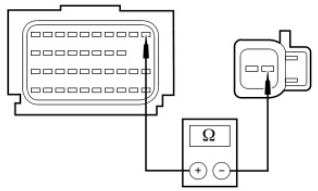
**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

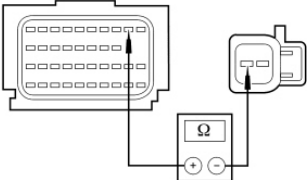
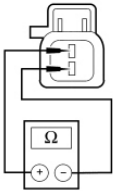
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>L1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2295 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2295 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2295 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>L2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>L16</u> .</p>
<b>L2 CHECK THE DRIVER AND PASSENGER SEAT SIDE AIR BAG MODULES</b>	

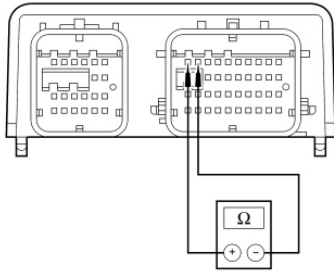
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• If the fault was reported for the driver seat side air bag module: <ul style="list-style-type: none"> <li>◆ Disconnect the driver seat side air bag module C315.</li> <li>◆ Connect restraint system diagnostic tool 418-133 to driver seat side air bag module C315.</li> </ul> </li> <li>• If the fault was reported for the passenger seat side air bag module: <ul style="list-style-type: none"> <li>◆ Disconnect the passenger seat side air bag module C316.</li> <li>◆ Connect restraint system diagnostic tool 418-133 to passenger seat side air bag module C316.</li> </ul> </li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2295 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2295 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2295 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b></p> <p>Using the fault PIDs recorded in Step L1, GO to the appropriate pinpoint test step.</p> <p>For 2295_31_OD (Side Air Bag Circuit Short to Battery, Front Driver Side) ( LFC 9-5), GO to <u>L3</u> .</p> <p>For 2295_30_OD (Side Air Bag Circuit Short to Ground, Front Driver Side) ( LFC 9-1), GO to <u>L4</u> .</p> <p>For 2295_29_OD (Side Air Bag Circuit Open, Front Driver Side) ( LFC 2-2), GO to <u>L5</u> .</p> <p>For 2295_28_OD (Side Air Bag Circuit Resistance Low, Front Driver Side) ( LFC 9-9), GO to <u>L7</u> .</p> <p>For 2295_27_OD (Side Air Bag Circuit Short to Battery, Front Passenger Side) ( LFC 9-6), GO to <u>L9</u> .</p> <p>For 2295_26_OD (Side Air Bag Circuit Short to Ground, Front Passenger Side) ( LFC 9-2), GO to <u>L10</u> .</p> <p>For 2295_25_OD (Side Air Bag Circuit Open, Front Passenger Side) ( LFC 2-3), GO to <u>L11</u> .</p> <p>For 2295_24_OD (Side Air Bag Circuit Resistance Low, Front Passenger Side) ( LFC 9-10), GO to <u>L13</u> .</p> <p><b>No</b></p> <p>If a fault was against the driver seat side air bag module in Step L1, REMOVE and INSPECT the seat side air bag module jumper harness for damage.</p> <p>If a concern is found, REPAIR or INSTALL a new seat jumper harness. GO to <u>L17</u> .</p> <p>If a concern was not found, INSTALL a new driver seat side air bag module. REFER to <u>Side Air Bag Module</u> in this section. GO to <u>L17</u> .</p> <p>If a fault was against the passenger seat side air bag module in Step L1, REMOVE and INSPECT the seat side air bag module jumper harness for damage.</p> <p>If a concern is found, REPAIR or INSTALL a new seat jumper harness. GO to <u>L17</u> .</p> <p>If a concern was not found, INSTALL a new passenger seat side air bag module. REFER to <u>Side Air Bag Module</u> in this section. GO to <u>L17</u> .</p>
<p><b>L3 CHECK CIRCUITS 1257 (WH/LB) AND 1258 (RD) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND DRIVER SEAT</b></p>	

<p><b>SIDE AIR BAG MODULE</b></p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Seat Side Air Bag Module Restraint System Diagnostic Tool .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between driver seat side air bag module C315-1, circuit 1257 (WH/LB), harness side and ground; and between driver seat side air bag module C315-2 circuit 1258 (RD), harness side and ground.</li> </ul>  <p>N0059342</p> <p>• Is voltage present on either circuit?</p>	<p><b>Yes</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bars. REPAIR circuit 1257 (WH/LB) or 1258 (RD). GO to <u>L17</u> .</p> <p><b>No</b> GO to <u>L15</u> .</p>
<p><b>L4 CHECK CIRCUITS 1257 (WH/LB) AND 1258 (RD) FOR A SHORT TO GROUND BETWEEN THE RCM AND DRIVER SEAT SIDE AIR BAG MODULE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Seat Side Air Bag Module Restraint System Diagnostic Tool .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>◆ RCM C310b-1, circuit 1257 (WH/LB), harness side and ground.</li> <li>◆ RCM C310b-2, circuit 1258 (RD), harness side and ground.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>L15</u> .</p> <p><b>No</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bars. REPAIR circuit 1257 (WH/LB) or 1258 (RD). GO to <u>L17</u> .</p>

 <p>A0041283</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	
<b>L5 CHECK CIRCUIT 1257 (WH/LB) FOR AN OPEN BETWEEN THE RCM AND DRIVER SEAT SIDE AIR BAG MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Seat Side Air Bag Module Restraint System Diagnostic Tool .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-1, circuit 1257 (WH/LB), harness side and driver seat side air bag module C315-1, circuit 1257 (WH/LB), harness side.</li> </ul>  <p>A0075116</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>L6</u> .</p> <p><b>No</b> REPAIR circuit 1257 (WH/LB). GO to <u>L17</u> .</p>
<b>L6 CHECK CIRCUIT 1258 (RD) FOR AN OPEN BETWEEN THE RCM AND DRIVER SEAT SIDE AIR BAG MODULE</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-2, circuit 1258 (RD), harness side and driver seat side air bag module C315-2, circuit 1258 (RD), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>L15</u> .</p> <p><b>No</b> REPAIR circuit 1258 (RD). GO to <u>L17</u> .</p>

 <p>A0075117</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>L7 CHECK FOR A SHORT BETWEEN DRIVER SEAT SIDE AIR BAG MODULE CIRCUITS 1257 (WH/LB) AND 1258 (RD)</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Seat Side Air Bag Module Restraint System Diagnostic Tool .</li> <li>• Measure the resistance between driver seat side air bag module C315-1, circuit 1257 (WH/LB), harness side and C315-2, circuit 1258 (RD), harness side.</li> </ul>  <p>A0029887</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 800 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>L8</u> .</p> <p><b>No</b> GO to <u>L15</u> .</p>
<p><b>L8 CHECK THE RCM FOR LOW RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b pins 1 and 2, component side.</li> </ul>	<p><b>Yes</b> GO to <u>L15</u> .</p> <p><b>No</b> REPAIR circuits 1257 (WH/LB) and 1258 (RD). GO to <u>L17</u> .</p>



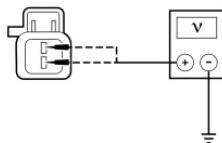


A0041286

- Is the resistance less than 800 ohms?

**L9 CHECK CIRCUITS 1259 (WH/YE) AND 1260 (BN/YE) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND PASSENGER SEAT SIDE AIR BAG MODULE**

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool .
- Disconnect: RCM C310a and C310b.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Measure the voltage between passenger seat side air bag module C316-1, circuit 1259 (WH/YE), harness side and ground; and between passenger seat side air bag module C316-2, circuit 1260 (BN/YE), harness side and ground.



N0059342

- Is voltage present on either circuit?

**L10 CHECK CIRCUITS 1259 (WH/YE) AND 1260 (BN/YE) FOR A SHORT TO**

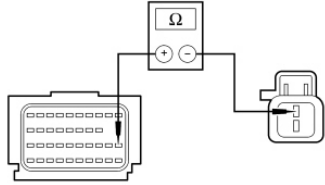
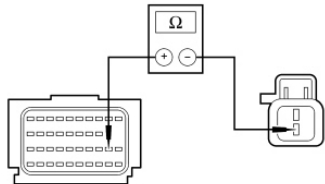
**Yes**

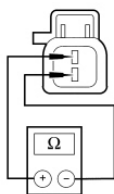
Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bars. REPAIR circuit 1259 (WH/YE) or 1260 (BN/YE). GO to L17 .

**No**

GO to L15 .

<b>GROUND BETWEEN THE RCM AND PASSENGER SEAT SIDE AIR BAG MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between:             <ul style="list-style-type: none"> <li>◆ RCM C310b-21, circuit 1259 (WH/YE), harness side and ground.</li> <li>◆ RCM C310b-22, circuit 1260 (BN/YE), harness side and ground.</li> </ul> </li> </ul> <div> <p>A0041288</p> </div> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>L15</u> .</p> <p><b>No</b> Due to the shorting bar feature in the electrical connector, the fault can exist in either circuit. Do not remove or defeat the shorting bars. REPAIR circuit 1259 (WH/YE) or 1260 (BN/YE). GO to <u>L17</u> .</p>
<b>L11 CHECK CIRCUIT 1259 (WH/YE) FOR AN OPEN BETWEEN THE RCM AND PASSENGER SEAT SIDE AIR BAG MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-21, circuit 1259 (WH/YE), harness side and passenger seat side air bag module C316-1, circuit 1259 (WH/YE), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>L12</u> .</p> <p><b>No</b> REPAIR circuit 1259 (WH/YE). GO to <u>L17</u> .</p>

 <p>N0003201</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>L12 CHECK CIRCUIT 1260 (BN/YE) FOR AN OPEN BETWEEN THE RCM AND PASSENGER SEAT SIDE AIR BAG MODULE</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-22, circuit 1260 (BN/YE), harness side and passenger seat side air bag module C316-2, circuit 1260 (BN/YE), harness side.</li> </ul>  <p>N0003202</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>L15</u> .</p> <p><b>No</b> REPAIR circuit 1260 (BN/YE). GO to <u>L17</u> .</p>
<p><b>L13 CHECK FOR A SHORT BETWEEN PASSENGER SEAT SIDE AIR BAG MODULE CIRCUITS 1259 (WH/YE) AND 1260 (BN/YE)</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Seat Side Air Bag Module Restraint System Diagnostic Tool .</li> <li>• Measure the resistance between passenger seat side air bag module C316-1, circuit 1259 (WH/YE), harness side and C316-2, circuit 1260 (BN/YE), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>L14</u> .</p> <p><b>No</b> GO to <u>L15</u> .</p>

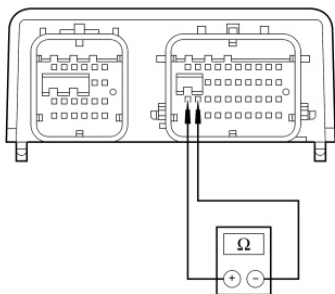


A0029887

- Is the resistance less than 800 ohms?

#### L14 CHECK THE RCM FOR LOW RESISTANCE

- Disconnect: RCM C310a and C310b.
- Measure the resistance between RCM C310b pins 21 and 22, component side.



A0041291

- Is the resistance less than 800 ohms?

#### L15 CONFIRM THE RCM FAULT

**NOTE:** Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Connect: Restraint System Diagnostic Tools.
- Connect: RCM C310a and C310b.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.

#### Yes

GO to L15 .

#### No

REPAIR circuits 1259 (WH/YE) and 1260 (BN/YE). GO to L17 .

#### Yes

INSTALL a new RCM . REFER to Restraints Control Module (RCM) . GO to L17 .

#### No

CHECK for causes of the intermittent fault.

ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness.

**Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.** REPAIR any intermittent wiring, terminals or connector concerns found. GO to L17 .

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record 2295 Fault PIDs.</li> <li>• <b>Was DTC B2295 retrieved on-demand during self-test?</b></li> </ul>	
<b>L16 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• If the fault was reported for the driver seat side air bag module: <ul style="list-style-type: none"> <li>◆ Disconnect the driver seat side air bag module C315.</li> <li>◆ Connect restraint system diagnostic tool 418-133 to driver seat side air bag module C315.</li> </ul> </li> <li>• If the fault was reported for the passenger seat side air bag module: <ul style="list-style-type: none"> <li>◆ Disconnect the passenger seat side air bag module C316.</li> <li>◆ Connect restraint system diagnostic tool 418-133 to passenger seat side air bag module C316.</li> </ul> </li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record 2295 Fault PIDs.</li> <li>• <b>Was DTC B2295 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b></p> <p>The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved during the on-demand self test. CHECK for causes of the intermittent fault at or near the affected seat side air bag module connector. REPAIR any intermittent wiring, terminals or connector concerns found.</p> <p>If an intermittent concern <b>was</b> found and repaired, GO to <u>L17</u> .</p> <p>If an intermittent concern <b>was not</b> found and repaired, USE the fault PIDs recorded and GO to the appropriate pinpoint test step.</p> <p>For 2295_31_OD (Side Air Bag Circuit Short to Battery, Front Driver Side) ( LFC 9-5), GO to <u>L3</u> .</p> <p>For 2295_30_OD (Side Air Bag Circuit Short to Ground, Front Driver Side) ( LFC 9-1), GO to <u>L4</u> .</p> <p>For 2295_29_OD (Side Air Bag Circuit Open, Front Driver Side) ( LFC 2-2), GO to <u>L6</u> .</p> <p>For 2295_28_OD (Side Air Bag Circuit Resistance Low, Front Driver Side) ( LFC 9-9), GO to <u>L7</u> .</p> <p>For 2295_27_OD (Side Air Bag Circuit Short to Battery, Front Passenger Side) ( LFC 9-6), GO to <u>L9</u> .</p> <p>For 2295_26_OD (Side Air Bag Circuit Short to Ground, Front Passenger Side) ( LFC 9-2), GO to <u>L10</u> .</p> <p>For 2295_25_OD (Side Air Bag Circuit Open, Front Passenger Side) ( LFC 2-3), GO to <u>L11</u> .</p> <p>For 2295_24_OD (Side Air Bag Circuit Resistance Low, Front Passenger Side) ( LFC 9-10), GO to <u>L13</u> .</p> <p><b>No</b></p> <p>CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently.</p>

	<p>ACTIVATE others systems in the same wire harness.</p> <p><b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>L17</u> .</p>
<b>L17 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b></p> <p>Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b></p> <p>CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

### Pinpoint Test M: DTC B2296

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

### Lamp Fault Codes (LFCs)

The following Lamp Fault Codes (LFCs) indicate the specific fault PIDs associated with DTC B2296:

LFC	Description	LFC	Description
4-2	LH Front Impact Severity Sensor Communication Fault	4-3	Driver Side Impact Sensor Communication Fault
4-4	Passenger Side Impact Sensor Communication Fault	4-11	LH Front Impact Severity Sensor Mounting Fault
4-12	Driver Side Impact Sensor Mounting Fault	4-13	Passenger Side Impact Sensor Mounting Fault
6-1	LH Impact Severity Sensor Internal Fault	6-2	Driver Side Impact Sensor Internal Fault
6-3	Passenger Side Impact Sensor Internal Fault	6-6	LH Front Impact Severity Sensor Short to Ground Fault
6-7		6-8	

	Driver Side Impact Sensor Short to Ground Fault		Passenger Side Impact sensor Short to Ground Fault
6-11	LH Front Impact Severity Sensor Short to Battery Fault	6-12	Driver Side Impact Sensor Short to Battery Fault
6-13	Passenger Side Impact Sensor Short to Battery Fault	12-2	RH Front Impact Severity Sensor Mounting Fault
12-3	RH Front Impact Severity Sensor Internal Fault	12-4	RH Front Impact Severity Sensor Communication Fault
12-5	RH Front Impact Severity Sensor Short to Ground Fault	12-6	RH Front Impact Severity Sensor Short to Battery Fault

### Normal Operation

The impact sensor(s) provide data to the Restraints Control Module (RCM) for use in calculating impact severity. This is accomplished using various electrical and electro-mechanical sensor(s) throughout the vehicle.

The RCM checks all of the impact sensor circuits for faults. If the RCM detects one of the following faults on any of the impact sensor circuits, it will store DTC B2296 in memory and, depending on the fault, flash a LFC on the air bag warning indicator.

Fault PIDs <sup>a</sup>	Description	Fault Trigger Condition
2296_3_OD and 2296_3_OD	Driver/Center Front Crash Sensor Circuit Short to Battery	When the Restraints Control Module (RCM) senses a short to voltage on the driver/center front impact sensor circuits, a fault will be indicated.
2296_4_OD and 2296_4_OD	Driver/Center Front Crash Sensor Circuit Short to Ground	When the RCM senses a short to ground on the driver/center front impact sensor circuits, a fault will be indicated.
2296_5_OD and 2296_5_OD	Driver/Center Front Crash Sensor Communication Fault	When the RCM is unable to communicate with the driver/center front impact sensor, a fault will be indicated.
2296_12_OD and 2296_12_CM	Side Crash Sensor Circuit Short to Battery, Front Passenger Side	When the RCM senses a short to voltage on the passenger side first row impact sensor circuits, a fault will be indicated.
2296_13_OD and 2296_13_CM	Side Crash Sensor Circuit Short to Ground, Front Passenger Side	When the RCM senses a short to ground on the passenger side first row impact sensor circuits, a fault will be indicated.
2296_14_OD and 2296_14_CM	Side Crash Sensor Communication Fault, Front Passenger Side	When the RCM is unable to communicate with the passenger side first row impact sensor, a fault will be indicated.
2296_15_OD and 2296_15_CM	Side Crash Sensor Circuit Short to Battery, Front Driver Side	When the RCM senses a short to voltage on the driver side first row impact sensor circuits, a fault will be indicated.
2296_16_OD and 2296_16_CM	Side Crash Sensor Circuit Short to Ground, Front Driver Side	When the RCM senses a short to ground on the driver side first row impact sensor circuits, a fault will be indicated.

2296_17_OD and 2296_17_CM	Side Crash Sensor Communication Fault, Front Driver Side	When the RCM is unable to communicate with the driver side first row impact sensor, a fault will be indicated.
2296_18_OD and 2296_18_CM	Driver/Center Front Crash Sensor Internal Fault	When the RCM senses a internal failure with the driver/center front impact sensor, a fault will be indicated.
2296_19_OD and 2296_19_CM	Driver/Center Front Crash Sensor Mount or Communication Fault	When the RCM is unable to communicate with the driver/center front impact sensor, a fault will be indicated.
2296_28_OD and 2296_28_CM	Side Crash Sensor Internal Fault, Front Passenger Side	When the RCM senses a internal failure with the passenger side first row impact sensor, a fault will be indicated.
2296_29_OD and 2296_29_CM	Side Crash Sensor Mount or Communication Fault, Front Passenger Side	When the RCM is unable to communicate with the driver side first row impact sensor, a fault will be indicated.
2296_30_OD and 2296_30_CM	Side Crash Sensor Internal Fault, Front Driver Side	When the RCM senses a internal failure with the driver/center front impact sensor, a fault will be indicated.
2296_31_OD and 2296_31_CM	Side Crash Sensor Mount or Communication Fault, Driver Front	When the RCM is unable to communicate with the driver side first row impact sensor, a fault will be indicated.
2296_55_OD and 2296_55_OD	Passenger Front Crash Sensor Circuit Short to Battery	When the RCM senses a short to voltage on the passenger front impact sensor circuits, a fault will be indicated.
2296_56_OD and 2296_56_OD	Passenger Front Crash Sensor Circuit Short to Ground	When the RCM senses a short to ground on the passenger front impact sensor circuits, a fault will be indicated.
2296_57_OD and 2296_57_CM	Passenger Front Crash Sensor Communication Fault	When the RCM is unable to communicate with the driver side first row impact sensor, a fault will be indicated.
2296_58_OD and 2296_58_CM	Passenger Front Crash Sensor Internal Fault	When the RCM senses a internal failure with the passenger front impact sensor, a fault will be indicated.
2296_59_OD and 2296_59_CM	Passenger Front Crash Sensor Mount or Communication Fault	When the RCM is unable to communicate with the passenger front impact sensor, a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2296. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC B2296.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Impact sensor
- Incorrect sensor mounting
- RCM

**PINPOINT TEST M: DTC B2296**

**⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to**



**follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.**

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

**NOTE:** Do not probe any impact sensor. The impact sensor can not be tested using a multi-meter.

Test Step	Result / Action to Take
<b>M1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p>For 2296_31_OD (Side Crash Sensor Mount or Communication Fault, Front Driver Side) ( LFC 4-12), GO to <u>M2</u> .</p> <p>For 2296_17_OD (Side Crash Sensor Communication Fault, Front Driver Side) ( LFC 4-3), GO to <u>M8</u> .</p> <p>For 2296_30_OD (Side Crash Sensor Internal Fault, Front Driver Side) ( LFC 6-2), INSTALL a new driver side impact sensor. REFER to <u>Side Impact Sensor</u> in this section. GO to <u>M44</u> .</p> <p>For 2296_16_OD (Side Crash Sensor Circuit Short to Ground, Front Driver Side) ( LFC 6-7), GO to <u>M7</u> .</p> <p>For 2296_15_OD (Side Crash Sensor Circuit Short to Battery, Front Driver Side) ( LFC 6-12), GO to <u>M6</u> .</p> <p>For 2296_29_OD (Side Crash Sensor Mount or Communication Fault, Front Passenger Side) ( LFC 4-13), GO to <u>M12</u> .</p>

For 2296\_14\_OD (Side Crash Sensor Communication Fault, Front Passenger Side) ( LFC 4-4), GO to M18 .

For 2296\_28\_OD (Side Crash Sensor Internal Fault, Front Passenger Side) ( LFC 6-3), INSTALL a new first row passenger side impact sensor. REFER to Side Impact Sensor in this section. GO to M44 .

For passenger side impact sensor with a short to ground fault (2296\_13\_OD (Side Crash Sensor Circuit Short to Ground, Front Passenger Side) ( LFC 6-8), GO to M17 .

For 2296\_12\_OD (Side Crash Sensor Circuit Short to Battery, Front Passenger Side) ( LFC 6-13), GO to M16 .

For 2296\_19\_OD (Driver/Center Front Crash Sensor Mount/Communication Fault) ( LFC 4-11), GO to M22 .

For 2296\_5\_OD (Driver/Center Front Crash Sensor Communication Fault) ( LFC 4-2), GO to M28 .

For 2296\_18\_OD (Driver/Center Front Crash Sensor Internal Fault) ( LFC 6-1), INSTALL a new front impact severity sensor. REFER to Front Impact Severity Sensor in this section. GO to M44 .

For 2296\_4\_OD (Driver/Center Front Crash Sensor Circuit Short to Ground) ( LFC 6-6), GO to M27 .

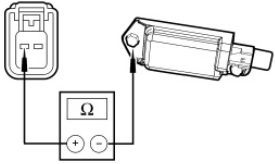
For 2296\_3\_OD (Driver/Center Front Crash Sensor Circuit Short to Battery) ( LFC 6-11), GO to M26 .

For RH front impact severity sensor with a mounting fault (2296\_59\_OD) ( LFC 12-2), GO to M32 .

For 2296\_57\_OD (Passenger Front Crash Sensor Communication Fault) ( LFC 12-4), GO to M38 .

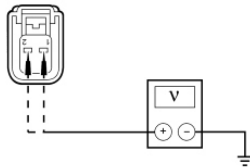
For 2296\_58\_OD (Passenger Front Crash Sensor Internal Fault) ( LFC 12-3), INSTALL a new RH front impact severity sensor. REFER to Front Impact Severity Sensor in this section. GO to M44 .

	<p>For 2296_56_OD (Passenger Front Crash Sensor Circuit Short to Ground) ( LFC 12-5), GO to <u>M37</u> .</p> <p>For 2296_55_OD (Passenger Front Crash Sensor Circuit Short to Battery) ( LFC 12-6), GO to <u>M36</u> .</p> <p><b>No</b> This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to <u>M43</u> .</p>
<b>M2 INSPECT THE DRIVER SIDE IMPACT SENSOR MOUNTING AND MOUNTING SURFACE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Access the driver side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Inspect the driver side impact sensor for: <ul style="list-style-type: none"> <li>◆ a loose electrical connector.</li> <li>◆ loose sensor mounting bolts.</li> </ul> </li> <li>• Remove the driver side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Inspect the driver side impact sensor, alignment tabs, electrical connector and mounting surface for damage, corrosion or dirt.</li> <li>• <b>Was a significant amount of damage, corrosion or dirt found, was the driver side impact sensor attached to the mounting surface incorrectly or were the impact sensor bolts not fully seated and tightened correctly?</b></li> </ul>	<p><b>Yes</b> CLEAN and TIGHTEN the bolts to the required specification. REPAIR the mounting surface and electrical connections as necessary. REINSTALL the driver side impact sensor. GO to <u>M44</u> .</p> <p><b>No</b> GO to <u>M3</u> .</p>
<b>M3 INSTALL THE DRIVER SIDE IMPACT SENSOR AND CARRY OUT THE SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the driver side impact sensor mounting bolts.</li> <li>• Install the driver side impact sensor and tighten to the required specification.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All</li> </ul>	<p><b>Yes</b> GO to <u>M4</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>

<p>2296 Fault PIDs.</p> <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	
<p><b>M4 CHECK THE DRIVER SIDE IMPACT SENSOR GROUND CIRCUIT 1262 (BN/LG) FOR HIGH RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Side Impact Sensor C305.</li> <li>• Measure the resistance between driver side impact sensor C305-2, circuit 1262 (BN/LG), harness side and the driver side impact sensor case ground bolt.</li> </ul>  <p>A0051256</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 100 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M11</u> .</p> <p><b>No</b> GO to <u>M5</u> .</p>
<p><b>M5 CLEAN THE DRIVER SIDE IMPACT SENSOR MOUNTING SURFACE AND CARRY OUT THE SELF TEST</b></p>	
<ul style="list-style-type: none"> <li>• Remove the driver side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the driver side impact sensor mounting bolts.</li> <li>• Install the driver side impact sensor and tighten to specifications.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M11</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>

**M6 CHECK CIRCUITS 1261 (WH/LG) AND 1262 (BN/LG) FOR A SHORT TO VOLTAGE BETWEEN THE DRIVER SIDE IMPACT SENSOR AND RCM**

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Driver Side Impact Sensor C305.
- Disconnect: RCM C310a and C310b.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Measure the voltage between driver side impact sensor C305-2, circuit 1262 (BN/LG), harness side and ground; and between C305-1, circuit 1261 (WH/LG), harness side and ground.

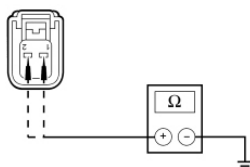


A0029894

- Is voltage present on either circuit?

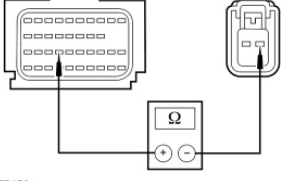
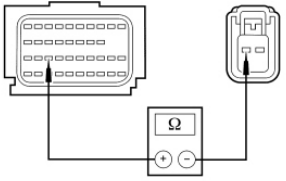
**Yes**REPAIR circuit 1261 (WH/LG) or 1262 (BN/LG). GO to M44 .**No**GO to M11 .
**M7 CHECK CIRCUITS 1261 (WH/LG) AND 1262 (BN/LG) FOR A SHORT TO GROUND BETWEEN THE DRIVER SIDE IMPACT SENSOR AND RCM**

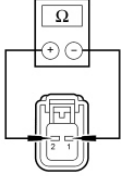
- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Driver Side Impact Sensor C305.
- Disconnect: RCM C310a and C310b.
- Measure the resistance between driver side impact sensor:
  - ♦ C305-2, circuit 1262 (BN/LG), harness side and ground.
  - ♦ C305-1, circuit 1261 (WH/LG), harness side and ground.

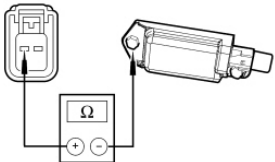


A0029893

**Yes**GO to M11 .**No**REPAIR circuit 1261 (WH/LG) or 1262 (BN/LG). GO to M44 .

<ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	
<b>M8 CHECK CIRCUIT 1261 (WH/LG) FOR AN OPEN BETWEEN THE RCM AND DRIVER SIDE IMPACT SENSOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Side Impact Sensor C305.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-27, circuit 1261 (WH/LG), harness side and driver side impact sensor C305-1, circuit 1261 (WH/LG), harness side.</li> </ul>  <p>A0077456</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M9</u> .</p> <p><b>No</b> REPAIR circuit 1261 (WH/LG). GO to <u>M44</u> .</p>
<b>M9 CHECK CIRCUIT 1262 (BN/LG) FOR AN OPEN BETWEEN THE RCM AND DRIVER SIDE IMPACT SENSOR</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-28, circuit 1262 (BN/LG), harness side and driver side impact sensor C305-2, circuit 1262 (BN/LG), harness side.</li> </ul>  <p>A0077457</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M10</u> .</p> <p><b>No</b> REPAIR circuit 1262 (BN/LG). GO to <u>M44</u> .</p>
<b>M10 CHECK CIRCUIT 1261 (WH/LG) FOR A SHORT TO CIRCUIT 1262 (BN/LG) BETWEEN THE RCM AND DRIVER SIDE IMPACT SENSOR</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between driver side impact sensor C305-1, circuit 1261 (WH/LG), and C305-2, circuit 1262 (BN/LG), harness side.</li> </ul>  <p>A0049598</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M11</u> .</p> <p><b>No</b> REPAIR circuits 1261 (WH/LG) and 1262 (BN/LG). GO to <u>M44</u> .</p>
<p><b>M11 CHECK THE DRIVER SIDE IMPACT SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Install a known good driver side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Were any on-demand fault PIDs for the driver side impact sensor indicating a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M42</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>
<p><b>M12 INSPECT THE PASSENGER SIDE IMPACT SENSOR MOUNTING AND MOUNTING SURFACE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Access the passenger side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Inspect the passenger side impact sensor for: <ul style="list-style-type: none"> <li>◆ a loose electrical connector.</li> <li>◆ loose sensor mounting bolts.</li> </ul> </li> <li>• Remove the passenger side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Inspect the passenger side impact sensor, alignment tabs, electrical connector and mounting</li> </ul>	<p><b>Yes</b> CLEAN and TIGHTEN the bolts to required specifications. REPAIR the mounting surface and electrical connections as necessary. REINSTALL the passenger side impact sensor. GO to <u>M44</u> .</p> <p><b>No</b> GO to <u>M13</u> .</p>

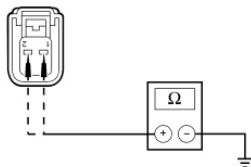
<p>surface for damage, corrosion or dirt.</p> <ul style="list-style-type: none"> <li>• <b>Was a significant amount of damage, corrosion or dirt found, was the passenger side impact sensor attached to the mounting surface incorrectly or were the sensor bolts not fully seated and tightened correctly?</b></li> </ul>	
<b>M13 INSTALL THE PASSENGER SIDE IMPACT SENSOR AND CARRY OUT THE SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the passenger side impact sensor mounting bolts.</li> <li>• Install the passenger side impact sensor and tighten to the required specification.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M14</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>
<b>M14 CHECK THE PASSENGER SIDE IMPACT SENSOR GROUND CIRCUIT 1264 (BN) FOR HIGH RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Side Impact Sensor C304.</li> <li>• Measure the resistance between passenger side impact sensor C304-2, circuit 1264 (BN), harness side and passenger side impact sensor case ground bolt.</li> </ul>  <p>A0051256</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 100 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M21</u> .</p> <p><b>No</b> GO to <u>M15</u> .</p>
<b>M15 CLEAN FIRST ROW PASSENGER SIDE IMPACT SENSOR MOUNTING SURFACE AND</b>	



CARRY OUT THE SELF TEST	
<ul style="list-style-type: none"> <li>• Remove the passenger side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the passenger side impact sensor mounting bolts.</li> <li>• Install the passenger side impact sensor and tighten to the required specifications.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M21</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>
M16 CHECK CIRCUITS 1264 (BN) AND 1263 (WH) FOR A SHORT TO VOLTAGE BETWEEN THE PASSENGER SIDE IMPACT SENSOR AND RCM	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Side Impact Sensor C304.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between passenger side impact sensor C304-2, circuit 1264 (BN), harness side and ground; and between C304-1, circuit 1263 (WH), harness side and ground.</li> </ul> <div> <p>A0029894</p> </div> <ul style="list-style-type: none"> <li>• <b>Is voltage present on either circuit?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 1264 (BN) or 1263 (WH). GO to <u>M44</u> .</p> <p><b>No</b> GO to <u>M21</u> .</p>

**M17 CHECK CIRCUITS 1264 (BN) AND 1263 (WH)  
FOR A SHORT TO GROUND BETWEEN THE  
PASSENGER SIDE IMPACT SENSOR AND RCM**

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Passenger Side Impact Sensor C304.
- Disconnect: RCM C310a and C310b.
- Measure the resistance between passenger side impact sensor:
  - ◆ C304-2, circuit 1264 (BN), harness side and ground.
  - ◆ C304-1, circuit 1263 (WH), harness side and ground.

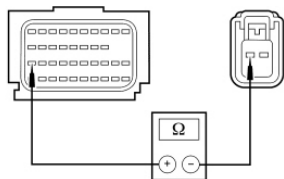


A0029893

- Are the resistances greater than 10,000 ohms?

**Yes**GO to M21 .**No**REPAIR circuit 1264 (BN) or 1263 (WH).  
GO to M44 .
**M18 CHECK CIRCUIT 1264 (BN) FOR AN OPEN  
BETWEEN THE RCM AND PASSENGER SIDE  
IMPACT SENSOR**

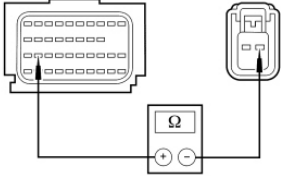
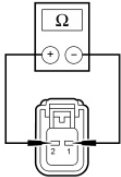
- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Passenger Side Impact Sensor C304.
- Disconnect: RCM C310a and C310b.
- Measure the resistance between RCM C310b-30, circuit 1264 (BN), harness side and passenger side impact sensor C304-2, circuit 1264 (BN), harness side.



A0077458

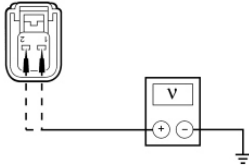
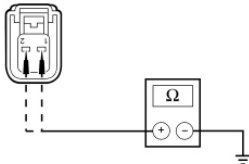
- Is the resistance less than 0.5 ohm?

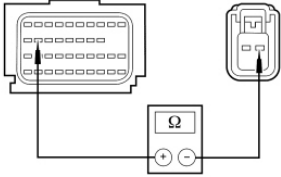
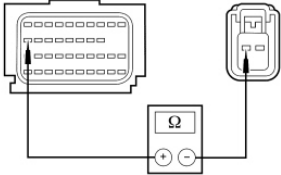
**Yes**GO to M19 .**No**REPAIR circuit 1264 (BN). GO to M44 .
**M19 CHECK CIRCUIT 1263 (WH) FOR AN OPEN  
BETWEEN THE RCM AND PASSENGER SIDE  
IMPACT SENSOR**

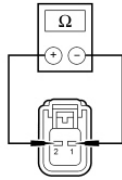
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-29, circuit 1263 (WH), harness side and passenger side impact sensor C304-1, circuit 1263 (WH), harness side.</li> </ul>  <p>A0077459</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M20</u> .</p> <p><b>No</b> REPAIR circuit 1263 (WH). GO to <u>M44</u> .</p>
<p><b>M20 CHECK CIRCUIT 1264 (BN) FOR A SHORT TO CIRCUIT 1263 (WH) BETWEEN THE RCM AND PASSENGER SIDE IMPACT SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between passenger side impact sensor C304-2, circuit 1264 (BN), harness side and C304-1, circuit 1263 (WH), harness side.</li> </ul>  <p>A0049598</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>M21</u> .</p> <p><b>No</b> REPAIR short between circuits 1264 (BN) and 1263 (WH). GO to <u>M44</u> .</p>
<p><b>M21 CHECK THE PASSENGER SIDE IMPACT SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Install a known good passenger side impact sensor. Refer to <u>Side Impact Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs.</li> </ul>	<p><b>Yes</b> GO to <u>M42</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>

<ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> <li>• <b>Were any on-demand fault PIDs the for passenger side impact sensor indicating a fault?</b></li> </ul>	
<b>M22 INSPECT THE LH FRONT IMPACT SEVERITY SENSOR MOUNTING AND MOUNTING SURFACE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Access the LH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Inspect the LH front impact severity sensor for: <ul style="list-style-type: none"> <li>◆ a loose electrical connector.</li> <li>◆ loose sensor mounting bolts.</li> </ul> </li> <li>• Remove the LH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Inspect the LH front impact severity sensor, alignment tabs, electrical connector and mounting surface for damage, corrosion or dirt.</li> <li>• <b>Was a significant amount of damage, corrosion or dirt found, was the LH front severity impact sensor attached to the mounting surface incorrectly or were the sensor bolts not fully seated and tightened correctly?</b></li> </ul>	<p><b>Yes</b> CLEAN and TIGHTEN bolts to the required specification, or REPAIR the mounting surface as necessary. REINSTALL the LH front impact severity sensor. GO to <u>M44</u> .</p> <p><b>No</b> GO to <u>M23</u> .</p>
<b>M23 INSTALL THE LH FRONT IMPACT SEVERITY SENSOR AND CARRY OUT THE SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the LH front impact severity sensor mounting bolts.</li> <li>• Install the LH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M24</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>

<b>M24 CHECK THE LH FRONT IMPACT SEVERITY SENSOR GROUND CIRCUIT 618 (VT/LG) FOR HIGH RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: LH Front Impact Severity Sensor C1465.</li> <li>• Measure the resistance between the LH front impact severity sensor C1465-2, circuit 618 (VT/LG), harness side and driver front impact severity sensor case ground.</li> <li>• <b>Is the resistance less than 100 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M31</u> .</p> <p><b>No</b> GO to <u>M25</u> .</p>
<b>M25 CLEAN THE LH FRONT IMPACT SEVERITY SENSOR MOUNTING SURFACE AND CARRY OUT THE SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Remove the LH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the LH front impact severity sensor mounting bolts.</li> <li>• Install the LH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M31</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>
<b>M26 CHECK CIRCUITS 617 (PK/OG) AND 618 (VT/LG) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND LH FRONT IMPACT SEVERITY SENSOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: LH Front Impact Severity Sensor C1465.</li> <li>• Disconnect: RCM C310a and C310b.</li> </ul>	<p><b>Yes</b> REPAIR circuit 617 (PK/OG) or 618 (VT/LG). GO to <u>M44</u> .</p> <p><b>No</b> GO to <u>M31</u> .</p>

<ul style="list-style-type: none"> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between LH front impact severity sensor C1465-1, circuit 617 (PK/OG), harness side and ground; and between LH front impact severity sensor C1465-2, circuit 618 (VT/LG), harness side and ground.</li> </ul>  <p>A0029894</p> <ul style="list-style-type: none"> <li>• <b>Is voltage present on either circuit?</b></li> </ul>	
<p><b>M27 CHECK CIRCUITS 617 (PK/OG) AND 618 (VT/LG) FOR A SHORT TO GROUND BETWEEN THE RCM AND LH FRONT IMPACT SEVERITY SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: LH Front Impact Severity Sensor C1465.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between LH front impact severity sensor: <ul style="list-style-type: none"> <li>◆ C1465-1, circuit 617 (PK/OG), harness side and ground.</li> <li>◆ C1465-2, circuit 618 (VT/LG), harness side and ground.</li> </ul> </li> </ul>  <p>A0029893</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M31</u> .</p> <p><b>No</b> REPAIR circuit 617 (PK/OG) or 618 (VT/LG). GO to <u>M44</u> .</p>
<p><b>M28 CHECK CIRCUIT 617 (PK/OG) FOR AN OPEN BETWEEN THE RCM AND LH FRONT IMPACT SEVERITY SENSOR</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: LH Front Impact Severity Sensor C1465.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-19, circuit 617 (PK/OG), harness side and LH front impact severity sensor C1465-1, circuit 617 (PK/OG), harness side.</li> </ul>  <p>A0077464</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M29</u> .</p> <p><b>No</b> REPAIR circuit 617 (PK/OG). GO to <u>M44</u> .</p>
<p><b>M29 CHECK CIRCUIT 618 (VT/LG) FOR AN OPEN BETWEEN THE RCM AND LH FRONT IMPACT SEVERITY SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-20, circuit 618 (VT/LG), harness side and LH front impact severity sensor C1465-2, circuit 618 (VT/LG), harness side.</li> </ul>  <p>A0077465</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M30</u> .</p> <p><b>No</b> REPAIR circuit 618 (VT/LG). GO to <u>M44</u> .</p>
<p><b>M30 CHECK CIRCUIT 617 (PK/OG) FOR A SHORT TO CIRCUIT 618 (VT/LG) BETWEEN THE RCM AND LH FRONT IMPACT SEVERITY SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between LH front impact severity sensor C1465-1, circuit 617 (PK/OG), harness side and LH front impact severity sensor C1465-2, circuit 618 (VT/LG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>M31</u> .</p> <p><b>No</b> REPAIR circuits 617 (PK/OG) and 618 (VT/LG). GO to <u>M44</u> .</p>



A0049598

- Is the resistance greater than 10,000 ohms?

### M31 CHECK THE LH FRONT IMPACT SEVERITY SENSOR

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Connect: RCM C310a and C310b.
- Install a known good LH front impact severity sensor. Refer to Front Impact Severity Sensor in this section.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self Test - RCM .
- Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs.
  - ◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.
- **Were any on-demand fault PIDs for the LH front impact severity sensor indicating a fault?**

**Yes**  
GO to M42 .

**No**  
Fault corrected. GO to M44 .

### M32 INSPECT THE RH FRONT IMPACT SEVERITY SENSOR MOUNTING AND MOUNTING SURFACE

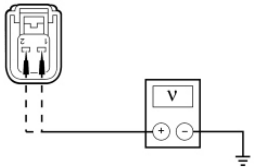
- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Access the RH front impact severity sensor. Refer to Front Impact Severity Sensor in this section.
- Inspect the RH front impact severity sensor for:
  - ◆ a loose electrical connector.
  - ◆ loose sensor mounting bolts.
- Remove the RH front impact severity sensor. Refer to Front Impact Severity Sensor in this section.
- Inspect the RH front impact severity sensor, alignment tabs, electrical connector and mounting surface for damage, corrosion or dirt.
- **Was a significant amount of damage, corrosion or dirt found, was the RH front severity impact**

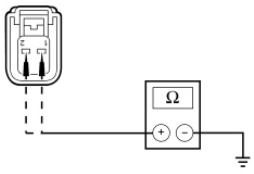
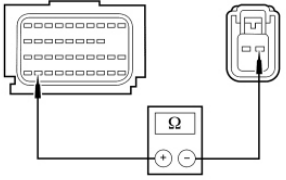
**Yes**  
CLEAN and TIGHTEN bolts to the required specification, or REPAIR the mounting surface as necessary. REINSTALL the RH front impact severity sensor. GO to M44 .

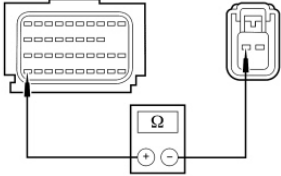
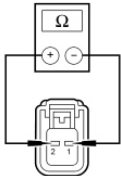
**No**  
GO to M33 .



sensor attached to the mounting surface incorrectly or were the sensor bolts not fully seated and tightened correctly?	
<b>M33 INSTALL THE RH FRONT IMPACT SEVERITY SENSOR AND CARRY OUT THE SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the RH front impact severity sensor mounting bolts.</li> <li>• Install the RH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>M34</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>
<b>M34 CHECK THE RH FRONT IMPACT SEVERITY SENSOR GROUND CIRCUIT 620 (VT/LB) FOR HIGH RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RH Front Impact Severity Sensor C1466.</li> <li>• Measure the resistance between RH front impact severity sensor C1466-2, circuit 620 (VT/LB), harness side and RH front impact severity sensor case ground.</li> <li>• <b>Is the resistance less than 100 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M41</u> .</p> <p><b>No</b> GO to <u>M35</u> .</p>
<b>M35 CLEAN THE RH FRONT IMPACT SEVERITY SENSOR MOUNTING SURFACE AND CARRY OUT THE SELF TEST</b>	
<ul style="list-style-type: none"> <li>• Remove the RH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Clean and repair the mounting surface as necessary.</li> <li>• Clean the RH front impact severity sensor mounting bolts.</li> </ul>	<p><b>Yes</b> GO to <u>M41</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>

<ul style="list-style-type: none"> <li>• Install the RH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	
<b>M36 CHECK CIRCUITS 619 (PK/WH) AND 620 (VT/LB) FOR A SHORT TO VOLTAGE BETWEEN THE RCM AND RH FRONT IMPACT SEVERITY SENSOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RH Front Impact Severity Sensor C1466.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between RH front impact severity sensor C1466-1, circuit 619 (PK/WH), harness side and ground; and between RH front impact severity sensor C1466-2, circuit 620 (VT/LB), harness side and ground.</li> </ul>  <p>A0029894</p> <ul style="list-style-type: none"> <li>• <b>Is voltage present on either circuit?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 619 (PK/WH) or 620 (VT/LB). GO to <u>M44</u> .</p> <p><b>No</b> GO to <u>M41</u> .</p>
<b>M37 CHECK CIRCUITS 619 (PK/WH) AND 620 (VT/LB) FOR A SHORT TO GROUND BETWEEN THE RCM AND RH FRONT IMPACT SEVERITY SENSOR</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RH Front Impact Severity Sensor C1466.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RH front impact severity sensor: <ul style="list-style-type: none"> <li>◆ C1466-1, circuit 619 (PK/WH), harness side and ground.</li> <li>◆ C1466-2, circuit 620 (VT/LB), harness side and ground.</li> </ul> </li> </ul>  <p>A0029893</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>M41</u> .</p> <p><b>No</b> REPAIR circuit 619 (PK/WH) or 620 (VT/LB). GO to <u>M44</u> .</p>
<p><b>M38 CHECK CIRCUIT 619 (PK/WH) FOR AN OPEN BETWEEN THE RCM AND RH FRONT IMPACT SEVERITY SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RH Front Impact Severity Sensor C1466.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310b-39, circuit 619 (PK/WH), harness side and RH front impact severity sensor C1466-1, circuit 619 (PK/WH), harness side.</li> </ul>  <p>N0033020</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M39</u> .</p> <p><b>No</b> REPAIR circuit 619 (PK/WH). GO to <u>M44</u> .</p>
<p><b>M39 CHECK CIRCUIT 620 (VT/LB) FOR AN OPEN BETWEEN THE RCM AND RH FRONT IMPACT SEVERITY SENSOR</b></p>	

<ul style="list-style-type: none"> <li>Measure the resistance between RCM C310b-40, circuit 620 (VT/LB), harness side and RH front impact severity sensor C1466-2, circuit 620 (VT/LB), harness side.</li> </ul>  <p>N0033021</p> <ul style="list-style-type: none"> <li>Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>M40</u> .</p> <p><b>No</b> REPAIR circuit 620 (VT/LB). GO to <u>M44</u> .</p>
<p><b>M40 CHECK CIRCUIT 619 (PK/WH) FOR A SHORT TO CIRCUIT 620 (VT/LB) BETWEEN THE RCM AND RH FRONT IMPACT SEVERITY SENSOR</b></p>	
<ul style="list-style-type: none"> <li>Measure the resistance between RH front impact severity sensor C1466-1, circuit 619 (PK/WH), harness side and RH front impact severity sensor C1466-2, circuit 620 (VT/LB), harness side.</li> </ul>  <p>A0049598</p> <ul style="list-style-type: none"> <li>Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>M41</u> .</p> <p><b>No</b> REPAIR circuits 619 (PK/WH) and 620 (VT/LB). GO to <u>M44</u> .</p>
<p><b>M41 CHECK THE FRONT IMPACT SEVERITY SENSOR</b></p>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Connect: RCM C310a and C310b.</li> <li>Install a known good RH front impact severity sensor. Refer to <u>Front Impact Severity Sensor</u> in this section.</li> <li>Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Ignition ON.</li> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> </ul>	<p><b>Yes</b> GO to <u>M42</u> .</p> <p><b>No</b> Fault corrected. GO to <u>M44</u> .</p>

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Were any on-demand fault PIDs for the RH front impact severity sensor indicating a fault?</b></li> </ul>	
<b>M42 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Install the original impact sensor.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . GO to <u>M44</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>M44</u> .</p>
<b>M43 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2296 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2296 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2296 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p>For 2296_31_OD (Side Crash Sensor Mount or Communication Fault, Front Driver Side) ( LFC 4-12), GO to <u>M2</u> .</p> <p>For 2296_17_OD (Side Crash Sensor Communication Fault, Front Driver Side) ( LFC 4-3), GO to <u>M8</u> .</p> <p>For 2296_30_OD (Side Crash Sensor Internal Fault, Front Driver Side) ( LFC 6-2),</p>

INSTALL a new driver side impact sensor. REFER to Side Impact Sensor in this section. GO to M44 .

For 2296\_16\_OD (Side Crash Sensor Circuit Short to Ground, Front Driver Side) ( LFC 6-7), GO to M7 .

For 2296\_15\_OD (Side Crash Sensor Circuit Short to Battery, Front Driver Side) ( LFC 6-12), GO to M6 .

For 2296\_29\_OD (Side Crash Sensor Mount or Communication Fault, Front Passenger Side) ( LFC 4-13), GO to M12 .

For 2296\_14\_OD (Side Crash Sensor Communication Fault, Front Passenger Side) ( LFC 4-4), GO to M18 .

For 2296\_28\_OD (Side Crash Sensor Internal Fault, Front Passenger Side) ( LFC 6-3), INSTALL a new first row passenger side impact sensor. REFER to Side Impact Sensor in this section. GO to M44 .

For passenger side impact sensor with a short to ground fault (2296\_13\_OD (Side Crash Sensor Circuit Short to Ground, Front Passenger Side) ( LFC 6-8), GO to M17 .

For 2296\_12\_OD (Side Crash Sensor Circuit Short to Battery, Front Passenger Side) ( LFC 6-13), GO to M16 .


For 2296\_19\_OD (Driver/Center Front Crash Sensor Mount/Communication Fault) ( LFC 4-11), GO to M22 .

For 2296\_5\_OD (Driver/Center Front Crash Sensor Communication Fault) ( LFC 4-2), GO to M28 .

For 2296\_18\_OD (Driver/Center Front Crash Sensor Internal Fault) ( LFC 6-1), INSTALL a new front impact severity sensor. REFER to Front Impact Severity Sensor in this section. GO to M44 .

For 2296\_4\_OD (Driver/Center Front Crash Sensor Circuit Short to Ground) ( LFC 6-6), GO to M27 .

For 2296\_3\_OD (Driver/Center Front Crash

	<p>Sensor Circuit Short to Battery) ( LFC 6-11), GO to <u>M26</u> .</p> <p>For RH front impact severity sensor with a mounting fault (2296_59_OD) ( LFC 12-2), GO to <u>M32</u> .</p> <p>For 2296_57_OD (Passenger Front Crash Sensor Communication Fault) ( LFC 12-4), GO to <u>M38</u> .</p> <p>For 2296_58_OD (Passenger Front Crash Sensor Internal Fault) ( LFC 12-3), INSTALL a new RH front impact severity sensor. REFER to <u>Front Impact Severity Sensor</u> in this section. GO to <u>M44</u> .</p> <p>For 2296_56_OD (Passenger Front Crash Sensor Circuit Short to Ground) ( LFC 12-5), GO to <u>M37</u> .</p> <p>For 2296_55_OD (Passenger Front Crash Sensor Circuit Short to Battery) ( LFC -6), GO to <u>M36</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>M44</u> .</p>
<b>M44 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul> |  |
|--|--|

**Pinpoint Test N: DTC B2432**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2432:

- LFC 5-1 - Driver Seat Belt Buckle Switch Circuit Open

**Normal Operation**

The safety belt buckles are equipped with Hall-effect switches. The safety belt buckle switches indicate to the Restraints Control Module (RCM) whether the safety belts are buckled or unbuckled.

The RCM checks the driver safety belt buckle switch circuits for faults. If the RCM detects an open circuit, it will store DTC B2432 in memory, flash LFC 5-1 on the air bag warning indicator.

- DTC B2432 (Driver Seat Belt Buckle Switch Circuit Open) - If the RCM detects an open circuit on the driver safety belt buckle switch, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Driver safety belt buckle switch
- RCM

**PINPOINT TEST N: DTC B2432**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

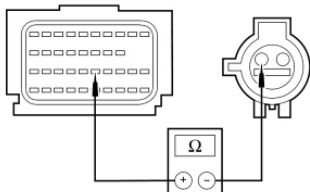
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

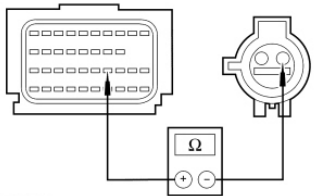
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .



**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>N1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B2432 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>N2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to <u>N6</u> .</p>
<b>N2 CHECK CIRCUIT 85 (BN/LB) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Disconnect: Driver Safety Belt Buckle Switch C3065.</li> <li>Measure the resistance between RCM C310b-25, circuit 85 (BN/LB), harness side and driver safety belt buckle switch C3065-1, circuit 85 (BN/LB), harness side.</li> </ul>  <p><b>• Is the resistance less than 0.5 ohm?</b></p>	<p><b>Yes</b> GO to <u>N3</u> .</p> <p><b>No</b> REPAIR circuit 85 (BN/LB). GO to <u>N7</u> .</p>
<b>N3 CHECK CIRCUIT 1558 (TN/BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>Measure the resistance between RCM C310b-24, circuit 1558 (TN/BK), harness side and driver safety belt buckle switch C3065-2, circuit 1558 (TN/BK), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>N4</u> .</p> <p><b>No</b> REPAIR open in circuit 1558 (TN/BK). GO to <u>N7</u> .</p>

 <p>• Is the resistance less than 0.5 ohm?</p>	
<b>N4 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH</b>	
<ul style="list-style-type: none"> <li>• Install a known good driver safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2432 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>N5</u> .</p> <p><b>No</b> Fault corrected. GO to <u>N7</u> .</p>
<b>N5 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original driver safety belt buckle.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2432 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>N7</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>N7</u> .</p>
<b>N6 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no</p>

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2432 retrieved on-demand during self-test?</b></li> </ul>	<p>longer retrieved on-demand during self test. GO to <u>N2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>N7</u> .</p>
<b>N7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test O: DTC B2433**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2433:

- LFC 7-9 - Driver Seat Belt Buckle Switch Circuit Short to Battery

**Normal Operation**

The safety belt buckles are equipped with Hall-effect switches. The safety belt buckle switches indicate to the Restraints Control Module (RCM) whether the safety belts are buckled or unbuckled.

The RCM checks the driver safety belt buckle switch circuits for faults. If the RCM detects a short to battery fault, it will store DTC B2433 in memory, flash LFC 7-9 on the air bag warning indicator.

- DTC B2433 (Drivers Seat Belt Buckle Switch Short to Battery) - If the RCM detects a short to voltage on the driver safety belt buckle circuit, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RCM

#### PINPOINT TEST O: DTC B2433

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

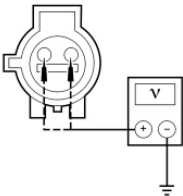
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>O1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2433 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Q2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>Q5</u> .</p>
<b>O2 CHECK CIRCUITS 85 (BN/LB) AND 1558 (TN/BK) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Driver Seat Side Air Bag</li> </ul>	<p><b>Yes</b> REPAIR circuit 85 (BN/LB) or 1558 (TN/BK). GO to <u>Q6</u> .</p> <p><b>No</b> GO to <u>Q3</u> .</p>

<p>Module C315.</p> <ul style="list-style-type: none"> <li>• Connect: Restraint System Diagnostic Tool 418-133 to Driver Seat Side Air Bag Module C315 .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: Driver Safety Belt Buckle Switch C3065.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between driver safety belt buckle switch C3065-1, circuit 85 (BN/LB), harness side and ground; and between driver safety belt buckle switch C3065-2, circuit 1558 (TN/BK), harness side and ground.</li> </ul>  <p>A0079453</p> <ul style="list-style-type: none"> <li>• <b>Is voltage present on either circuit?</b></li> </ul>	
<p><b>O3 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Install a known good driver safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2433 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>O4</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>O6</u> .</p>
<p><b>O4 CONFIRM THE RCM FAULT</b></p>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical</p>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>O6</u> .</p>

<p>connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original driver safety belt buckle.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2433 retrieved on-demand during self-test?</b></li> </ul>	<p><b>No</b></p> <p>CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Q6</u> .</p>
<p><b>O5 CHECK FOR AN INTERMITTENT FAULT</b></p>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2433 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b></p> <p>The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Q2</u> .</p> <p><b>No</b></p> <p>CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Q6</u> .</p>
<p><b>O6 CHECK FOR ADDITIONAL SRS DTCs</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS)</u></li> </ul>	<p><b>Yes</b></p> <p>Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b></p> <p>CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

<p><u>Depowering and Repowering</u> in this section.</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	
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### Pinpoint Test P: DTC B2434

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2434:

- LFC 7-1 - Driver Seat Belt Buckle Switch Circuit Short to Ground

#### Normal Operation

The safety belt buckles are equipped with Hall-effect switches. The safety belt buckle switch indicates to the Restraints Control Module (RCM) whether the safety belt is buckled or unbuckled.

The RCM checks the driver safety belt buckle switch circuits for faults. If the RCM detects a short to ground fault, it will store DTC B2434 in memory, flash LFC 7-1 on the air bag warning indicator.

- DTC B2434 (Drivers Seat Belt Buckle Switch Short to Ground) - If the RCM detects a short to ground on the driver safety belt buckle circuit, it will set this DTC.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Driver safety belt buckle switch
- RCM

### PINPOINT TEST P: DTC B2434

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

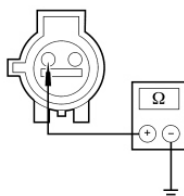
**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

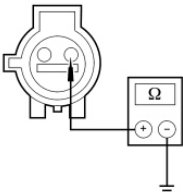
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>P1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B2434 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>P2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a Continuous Memory Diagnostic Trouble Code (CMDTC) only. GO to <u>P6</u> .</p>
<b>P2 CHECK CIRCUIT 85 (BN/LB) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Disconnect: Driver Safety Belt Buckle Switch C3065.</li> <li>Measure the resistance between driver safety belt buckle switch C3065-1, circuit 85 (BN/LB), harness side and ground.</li> </ul>  <p>A0079454</p> <ul style="list-style-type: none"> <li><b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>P3</u> .</p> <p><b>No</b> REPAIR circuit 85 (BN/LB). GO to <u>P7</u> .</p>
<b>P3 CHECK CIRCUIT 1558 (TN/BK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Measure the resistance between driver safety belt buckle switch C3065-2, circuit 1558 (TN/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>P4</u> .</p> <p><b>No</b> REPAIR circuit 1558 (TN/BK). GO to <u>P7</u> .</p>



 <p>N0005568</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>P4 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH</b>	
<ul style="list-style-type: none"> <li>• Install a known good driver safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2434 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>P5</u> .</p> <p><b>No</b> Fault corrected. GO to <u>P7</u> .</p>
<b>P5 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original driver safety belt buckle.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2434 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>P7</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>P7</u> .</p>
<b>P6 CHECK FOR AN INTERMITTENT FAULT</b>	

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2434 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>P2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>P7</u> .</p>
<b>P7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test Q: DTC B2435**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2435:

- LFC 7-5 - Driver Seat Belt Buckle Switch Circuit Resistance Out of Range

**Normal Operation**

The safety belt buckles are equipped with Hall-effect switches. The safety belt switches indicate to the Restraints Control Module (RCM) whether the safety belts are connected or disconnected.

The RCM checks the driver safety belt buckle switch circuits for faults. If the RCM detects a current out of range fault, it will store DTC B2435 in memory, flash LFC 7-5 on the air bag warning indicator.

- DTC B2435 (Drivers Seat Belt Buckle Switch Resistance Out of Range) - If the RCM detects a current out of range between buckled and unbuckled on the driver safety belt buckle switch, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Driver safety belt buckle
- RCM

#### PINPOINT TEST Q: DTC B2435

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.


**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>Q1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2435 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Q2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>Q3</u> .</p>
<b>Q2 CHECK THE DRIVER SAFETY BELT BUCKLE SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System</u></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>Q4</u> .</p>

<p><u>(SRS) Depowering and Repowering</u> in this section.</p> <ul style="list-style-type: none"> <li>• Install a known good driver safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2435 retrieved on-demand during self-test?</b></li> </ul>	<p><b>No</b> Fault corrected. GO to <u>Q4</u> .</p>
<p><b>Q3 CHECK FOR AN INTERMITTENT FAULT</b></p>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2435 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Q2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Q4</u> .</p>
<p><b>Q4 CHECK FOR ADDITIONAL SRS DTCs</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

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| <ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul> |  |
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**Pinpoint Test R: DTC B2436**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2436:

- LFC 5-2 - Passenger Seat Belt Buckle Switch Circuit Open

**Normal Operation**

The safety belt buckles are equipped with Hall-effect switches. The safety belt switches indicate to the Restraints Control Module (RCM) whether the safety belts are connected (switch closed) or disconnected (switch open).

The RCM checks the passenger safety belt buckle switch circuits for faults. If the RCM detects an open fault, it will store DTC B2436 in memory, flash LFC 5-2 on the air bag warning indicator.

- DTC B2436 (Passenger Seat Belt Buckle Switch Circuit Open) - If the RCM detects an open circuit on the passenger safety belt buckle switch, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Passenger safety belt buckle switch
- RCM

**PINPOINT TEST R: DTC B2436**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

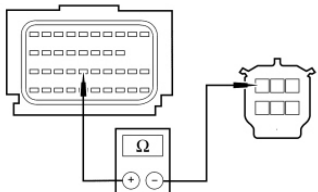
**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

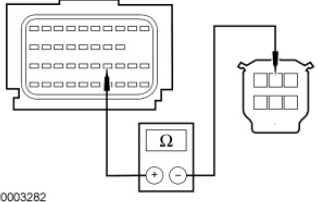
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.


**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>R1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2436 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and DTC is no longer retrieved on-demand during self test. GO to <u>R2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>R6</u> .</p>
<b>R2 CHECK CIRCUIT 1514 (RD/BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: Passenger Safety Belt Buckle Switch and Belt Tension Sensor C3066.</li> <li>• Measure the resistance between RCM C310b-26, circuit 1514 (RD/BK), harness side and passenger safety belt buckle switch and BTS C3066-1, circuit 1514 (RD/BK) harness side.</li> </ul>  <p>N0003281</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 0.5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>R3</u> .</p> <p><b>No</b> REPAIR circuit 1514 (RD/BK). GO to <u>R7</u> .</p>
<b>R3 CHECK CIRCUIT 1558 (TN/BK) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-24, circuit 1558 (TN/BK), harness side and passenger safety belt buckle switch and BTS C3066-2, circuit 1558 (TN/BK), harness side.</li> </ul>  <p>N0003282</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>R4</u> .</p> <p><b>No</b> REPAIR open in circuit 1558 (TN/BK). GO to <u>R7</u> .</p>
<p><b>R4 CHECK THE PASSENGER SAFETY BELT BUCKLE SWITCH</b></p>	
<ul style="list-style-type: none"> <li>• Install a known good passenger safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2436 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>R5</u> .</p> <p><b>No</b> Fault corrected. GO to <u>R7</u> .</p>
<p><b>R5 CONFIRM RCM FAULT</b></p>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original passenger safety belt buckle.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>R7</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>R7</u> .</p>

<ul style="list-style-type: none"> <li>• Was DTC B2436 retrieved on-demand during self-test?</li> </ul>	
<b>R6 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Was DTC B2436 retrieved on-demand during self-test?</li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>R2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>R7</u> .</p>
<b>R7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Are any DTCs retrieved on-demand during self-test?</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test S: DTC B2437**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2437:

- LFC 7-10 - Passenger Seat Belt Buckle Switch Circuit Short to Battery



**Normal Operation**

The safety belt buckles are equipped with Hall-effect switches. The safety belt switches indicate to the Restraints Control Module (RCM) whether the safety belts are buckled or unbuckled.

The RCM checks the passenger safety belt buckle switch circuits for faults. If the RCM detects a short to battery fault, it will store DTC B2437 in memory, flash LFC 7-10 on the air bag warning indicator.

- DTC B2437 (Passengers Seat Belt Buckle Switch Short to Battery) - If the RCM detects a short to voltage on the passenger safety belt buckle circuit, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RCM

**PINPOINT TEST S: DTC B2437**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

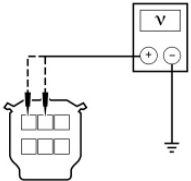
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>S1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2437 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>S2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>S5</u> .</p>
<b>S2 CHECK CIRCUITS 1514 (RD/BK) AND 1558 (TN/BK) FOR A SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: Passenger Seat Side Air Bag Module C316 .</li> <li>• Connect: Restraint System Diagnostic Tool 418-133 to Passenger Seat Side Air Bag Module C316 .</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: Passenger Safety Belt Buckle Switch and BTS C3066.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between passenger safety belt buckle switch and BTS C3066-1, circuit 1514 (RD/BK), harness side and ground; and between passenger safety belt buckle switch and BTS C3066-2, circuit 1558 (TN/BK), harness side and ground.</li> </ul>  <p>N0003718</p> <ul style="list-style-type: none"> <li>• <b>Is voltage present on either circuit?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 1514 (RD/BK) or 1558 (TN/BK). GO to <u>S6</u> .</p> <p><b>No</b> GO to <u>S3</u> .</p>
<p><b>S3 CHECK THE PASSENGER SAFETY BELT BUCKLE SWITCH</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: RCM C310a and C310b.</li> <li>• Install a known good passenger safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2437 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>S4</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>S6</u> .</p>

<b>S4 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original passenger safety belt buckle.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2437 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>S6</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>S6</u> .</p>
<b>S5 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2437 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>S2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>S6</u> .</p>
<b>S6 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

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| <ul style="list-style-type: none"> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul> |  |
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**Pinpoint Test T: DTC B2438**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2438:

- LFC 7-2 - Passenger Seat Belt Buckle Switch Circuit Short to Ground

**Normal Operation**

The safety belt buckles are equipped with Hall-effect switches. The safety belt switches indicate to the Restraints Control Module (RCM) whether the safety belts are connected or disconnected.

The RCM checks the passenger safety belt buckle switch circuits for faults. If the RCM detects a short to ground fault, it will store DTC B2438 in memory, flash LFC 7-2 on the air bag warning indicator.

- DTC B2438 (Passengers Seat Belt Buckle Switch Short to Ground) - If the RCM detects a short to ground on the passenger safety belt buckle circuit, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Passenger safety belt buckle switch
- RCM

**PINPOINT TEST T: DTC B2438**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

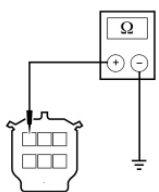
**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>T1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B2438 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>T2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>T5</u> .</p>
<b>T2 CHECK CIRCUIT 1514 (RD/BK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Disconnect: Passenger Safety Belt Buckle Switch and BTS C3066.</li> <li>Measure the resistance between passenger safety belt buckle switch and BTS C3066-1, circuit 1514 (RD/BK), harness side and ground.</li> </ul>  <p>N0003284</p> <ul style="list-style-type: none"> <li><b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>T3</u> .</p> <p><b>No</b> REPAIR circuit 1514 (RD/BK). GO to <u>T6</u> .</p>
<b>T3 CHECK THE PASSENGER SAFETY BELT BUCKLE SWITCH</b>	
<ul style="list-style-type: none"> <li>Connect: RCM C310a and C310b.</li> <li>Install a known good passenger safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in</li> </ul>	<p><b>Yes</b> GO to <u>T4</u> .</p> <p><b>No</b> Fault corrected. GO to <u>T6</u> .</p>

<p>this section.</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2438 retrieved on-demand during self-test?</b></li> </ul>	
<b>T4 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original passenger safety belt buckle.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2438 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>T6</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>T6</u> .</p>
<b>T5 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC B2438 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>T2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>T6</u> .</p>
<b>T6 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p>

<p><b>result in serious personal injury or death in the event of an accidental deployment.</b></p> <ul style="list-style-type: none"> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>No</b></p> <p>CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>
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### Pinpoint Test U: DTC B2439

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2439:

- LFC 7-6 - Passenger Seat Belt Buckle Switch Circuit Resistance Out of Range

#### Normal Operation

The safety belt buckles are equipped with Hall-effect switches. The safety belt switches indicate to the Restraints Control Module (RCM) whether the safety belts are connected or disconnected. Refer to Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) in this section.

The RCM checks the passenger safety belt buckle switch circuits for faults. If the RCM detects a current out of range fault, it will store DTC B2439 in memory, flash LFC 7-6 on the air bag warning indicator.

- DTC B2439 (Passengers Seat Belt Buckle Switch Resistance Out of Range) - If the RCM detects a current out of range between buckled and unbuckled on the passenger safety belt buckle switch, it will set this DTC.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Passenger safety belt buckle switch
- RCM

### PINPOINT TEST U: DTC B2439

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules,

which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.


**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>U1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B2439 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>U2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>U3</u> .</p>
<b>U2 CHECK THE PASSENGER SAFETY BELT BUCKLE SWITCH</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Install a known good passenger safety belt buckle. Refer to <u>Section 501-20A</u> .</li> <li>Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Ignition ON.</li> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B2439 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . Refer to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>U4</u> .</p> <p><b>No</b> Fault corrected. GO to <u>U4</u> .</p>
<b>U3 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC B2439 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>U2</u> .</p> <p><b>No</b></p>



	CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>U4</u> .
<b>U4 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test V: DTC B2792**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC B2792:

- LFC 12-11 - Cross Link Between Firing Loops

**Normal Operation**

The Restraints Control Module (RCM) monitors all deployable devices for a cross link fault between circuits. If the RCM detects a short between any of the deployable circuits, it will store a diagnostic trouble code B2792 in memory, flash LFC 12-11 on the air bag warning indicator.

Fault PIDs <sup>a</sup>	Description	Fault Trigger Condition
	Side Airbag Passenger	

2792_12_OD and 2792_12_CM		When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_13_OD and 2792_13_CM	Side Airbag Driver	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_26_OD and 2792_26_CM	Pretensioner Passenger	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_27_OD and 2792_27_CM	Pretensioner Driver	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_28_OD and 2792_28_CM	Airbag Passenger Front Loop #2	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_29_OD and 2792_29_CM	Airbag Passenger Front Loop #1	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_30_OD and 2792_30_CM	Airbag Driver Front Loop #2	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.
2792_31_OD and 2792_31_CM	Airbag Driver Front Loop #1	When the RCM detects a short between the circuits of 2 deployable devices, a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2792. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC B2792.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RCM

**PINPOINT TEST V: B2792**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.


**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take																		
<b>V1 RETRIEVE RCM DTCs</b>																			
<ul style="list-style-type: none"><li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li><li>• Enter the following diagnostic mode on the scan tool: Datalogger - RCM - View and Record All 2792 Fault PIDs.</li><li>• <b>Do any 2792 fault PIDs indicate a fault?</b></li></ul>	<p><b>Yes</b> This fault cannot be cleared until it is corrected and the fault PID is no longer retrieved on-demand during self test. GO to <u>V2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only. GO to <u>V5</u> .</p>																		
<b>V2 CHECK DEPLOYABLE CIRCUITS FOR A CROSS LINK FAULT</b>																			
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li><li>• Disconnect: RCM C310a and C310b.</li><li>• Disconnect <b>ALL of the affected</b> SRS devices.</li><li>• <b>NOTE:</b> Most cross link faults are due to connector and/or wiring harness damage. Carry out a thorough inspection of connector(s) and/or wiring harness for damage.</li><li>• Using the following table, measure resistance between the circuits of the affected SRS devices.</li></ul> <p><b>Cross Link Fault Chart</b></p> <table><tr><th>Device/Loop</th><th>Connector - Pin</th><th>Circuit</th></tr><tr><td>Driver air bag module stage 1</td><td><ul style="list-style-type: none"><li>• Driver air bag module stage 1 electrical connector</li></ul></td><td><ul style="list-style-type: none"><li>• 614 (GY/OG)</li><li>• 615 (GY/WH)</li></ul></td></tr><tr><td>Driver air bag module stage 2</td><td><ul style="list-style-type: none"><li>• Driver air bag module stage 2 electrical connector</li></ul></td><td><ul style="list-style-type: none"><li>•1516 (YE/WH)</li><li>•1517 (RD/OG)</li></ul></td></tr><tr><td>Passenger air bag module stage 1</td><td><ul style="list-style-type: none"><li>• C256a-2</li><li>• C256a-1</li></ul></td><td><ul style="list-style-type: none"><li>• 616 (PK/BK)</li><li>• 607 (LB/OG)</li></ul></td></tr><tr><td>Passenger air bag module stage 2</td><td><ul style="list-style-type: none"><li>• C256b-2</li><li>• C256b-1</li></ul></td><td><ul style="list-style-type: none"><li>•1519 (LG/RD)</li><li>•1518 (BK/WH)</li></ul></td></tr><tr><td></td><td><ul style="list-style-type: none"><li>• C367-1</li></ul></td><td></td></tr></table>	Device/Loop	Connector - Pin	Circuit	Driver air bag module stage 1	<ul style="list-style-type: none"><li>• Driver air bag module stage 1 electrical connector</li></ul>	<ul style="list-style-type: none"><li>• 614 (GY/OG)</li><li>• 615 (GY/WH)</li></ul>	Driver air bag module stage 2	<ul style="list-style-type: none"><li>• Driver air bag module stage 2 electrical connector</li></ul>	<ul style="list-style-type: none"><li>•1516 (YE/WH)</li><li>•1517 (RD/OG)</li></ul>	Passenger air bag module stage 1	<ul style="list-style-type: none"><li>• C256a-2</li><li>• C256a-1</li></ul>	<ul style="list-style-type: none"><li>• 616 (PK/BK)</li><li>• 607 (LB/OG)</li></ul>	Passenger air bag module stage 2	<ul style="list-style-type: none"><li>• C256b-2</li><li>• C256b-1</li></ul>	<ul style="list-style-type: none"><li>•1519 (LG/RD)</li><li>•1518 (BK/WH)</li></ul>		<ul style="list-style-type: none"><li>• C367-1</li></ul>		<p><b>Yes</b> GO to <u>V3</u> .</p> <p><b>No</b> REPAIR the affected circuits. GO to <u>V5</u> .</p>
Device/Loop	Connector - Pin	Circuit																	
Driver air bag module stage 1	<ul style="list-style-type: none"><li>• Driver air bag module stage 1 electrical connector</li></ul>	<ul style="list-style-type: none"><li>• 614 (GY/OG)</li><li>• 615 (GY/WH)</li></ul>																	
Driver air bag module stage 2	<ul style="list-style-type: none"><li>• Driver air bag module stage 2 electrical connector</li></ul>	<ul style="list-style-type: none"><li>•1516 (YE/WH)</li><li>•1517 (RD/OG)</li></ul>																	
Passenger air bag module stage 1	<ul style="list-style-type: none"><li>• C256a-2</li><li>• C256a-1</li></ul>	<ul style="list-style-type: none"><li>• 616 (PK/BK)</li><li>• 607 (LB/OG)</li></ul>																	
Passenger air bag module stage 2	<ul style="list-style-type: none"><li>• C256b-2</li><li>• C256b-1</li></ul>	<ul style="list-style-type: none"><li>•1519 (LG/RD)</li><li>•1518 (BK/WH)</li></ul>																	
	<ul style="list-style-type: none"><li>• C367-1</li></ul>																		

Driver seat side air bag module	<ul style="list-style-type: none"> <li>• C367-2</li> </ul>	<ul style="list-style-type: none"> <li>• 1257 (WH/LB)</li> <li>• 1258 (RD)</li> </ul>
Passenger seat side air bag module	<ul style="list-style-type: none"> <li>• C337-1</li> <li>• C337-2</li> </ul>	<ul style="list-style-type: none"> <li>• 1259 (WH/YE)</li> <li>• 1260 (BN/YE)</li> </ul>
Driver safety belt pretensioner	<ul style="list-style-type: none"> <li>• C3014-1</li> <li>• C3014-3</li> </ul>	<ul style="list-style-type: none"> <li>• 1079 (LG/RD)</li> <li>• 1080 (LG/BK)</li> </ul>
Passenger safety belt pretensioner	<ul style="list-style-type: none"> <li>• C303-1</li> <li>• C303-3</li> </ul>	<ul style="list-style-type: none"> <li>• 1081 (YE/RD)</li> <li>• 1082 (LB/BK)</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms between the affected circuits?</b></li> </ul>		
<b>V3 CONFIRM THE RCM FAULT</b>		
<ul style="list-style-type: none"> <li>• Connect: RCM C310a and C310b.</li> <li>• Connect: All Previously Disconnected SRS Components.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2792 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2792 fault PIDs.</li> </ul> </li> <li>• <b>Does the original on-demand 2792 fault PID indicate a fault?</b></li> </ul>		<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>V5</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>V4</u> .</p>
<b>V4 CHECK FOR AN INTERMITTENT FAULT</b>		
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• If a cross link fault is with the driver air bag module loop 1 or loop 2: <ul style="list-style-type: none"> <li>◆ Remove the driver air bag module. Refer to <u>Driver Air Bag Module</u> in this section.</li> <li>◆ Connect Restraint System Diagnostic Tool 418-F395 (2 required) to the driver air bag module loop connectors.</li> </ul> </li> <li>• If a cross link fault is with the passenger air bag module loop 1 or loop 2:</li> </ul>		<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to <u>V2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. <b>Do not install any new SRS components at this time. SRS components should only be installed</b></p>

<ul style="list-style-type: none"> <li>◆ Disconnect the passenger air bag module C256.</li> <li>◆ Connect Restraint System Diagnostic Tool 418-F403 to the passenger air bag module C256.</li> <li>• If a cross link fault is with the driver seat side air bag module: <ul style="list-style-type: none"> <li>◆ Disconnect the driver seat side air bag module C315.</li> <li>◆ Connect Restraint System Diagnostic Tool 418-133 to the driver seat side air bag module C315.</li> </ul> </li> <li>• If a cross link fault is with the passenger seat side air bag module air bag module: <ul style="list-style-type: none"> <li>◆ Disconnect the passenger seat side air bag module C316.</li> <li>◆ Connect Restraint System Diagnostic Tool 418-133 to the passenger seat side air bag module C316.</li> </ul> </li> <li>• If a cross link fault is with the driver safety belt retractor pretensioner C3014: <ul style="list-style-type: none"> <li>◆ Disconnect the driver safety belt retractor pretensioner C3014.</li> <li>◆ Connect Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013) to the driver safety belt retractor pretensioner C3014.</li> </ul> </li> <li>• If a cross link fault is with the passenger safety belt retractor pretensioner C303: <ul style="list-style-type: none"> <li>◆ Disconnect the passenger safety belt retractor pretensioner C303.</li> <li>◆ Connect Restraint System Diagnostic Tool 418-F088 (105-R0012 or 105-R0013) to the passenger safety belt retractor pretensioner C303.</li> </ul> </li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2792 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2792 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2792 fault PIDs indicate a fault?</b></li> </ul>	<p><b>when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>V5</u> .</p>
<b>V5 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p>

<p><b>accidental deployment.</b></p> <ul style="list-style-type: none"> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>No</b></p> <p>CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>
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### Pinpoint Test W: DTC B2909

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

### Lamp Fault Codes (LFCs)

The following Lamp Fault Codes (LFCs) indicate the specific fault PIDs associated with DTC B2909:

- LFC 7-13 - Belt Tension Sensor Open or Short to Battery
- LFC 7-14 - Belt Tension Sensor Short to Ground

### Normal Operation

The Belt Tension Sensor (BTS) operates in conjunction with the Occupant Classification System (OCS) system. The Occupant Classification System Module (OCSM) for the OCS system interprets a variable voltage signal provided by the BTS to identify the possible presence of a child safety seat in the front passenger seat.

The OCS system components (seat cushion foam pad, bladder with pressure sensor and OCSM ) are calibrated to each other and are serviced as an assembly. The OCS system components are not to be installed separately with the exception of the BTS . If a new OCS system, OCS system component or seat cushion foam pad are needed, a new OCS system service kit (seat cushion foam pad, bladder with pressure sensor and OCSM ) must be installed as an assembly.

The OCSM monitors the BTS circuits for faults. If a fault is detected on any of the BTS sensor circuits, it will report the failure to the Restraints Control Module (RCM). The RCM will store DTC B2909 in memory and, depending on the fault, flash a LFC on the air bag warning indicator. The secondary air bag warning chime will also be activated.

Fault PIDs <sup>a</sup>	Description	Fault Trigger Condition
2909_29_OD and 2909_29_CM	Front Passenger Side Belt Tension Sensor Short to Ground	When the Occupant Classification System Module (OCSM) senses a short to ground on the BTS circuits, a fault will be indicated.
2909_31_OD and 2909_31_CM	Front Passenger Side Belt Tension Sensor Circuit Fault	When the OCSM senses a failure on the BTS circuits, a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC B2909. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC

B2909.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- BTS
- OCSM

#### PINPOINT TEST W: DTC B2909

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

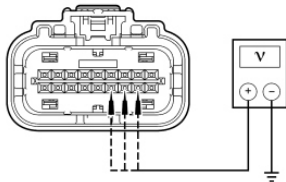
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

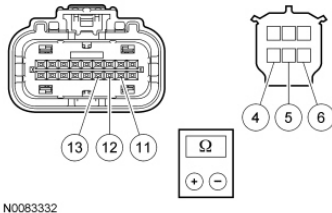
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>W1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2909 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2909 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2909 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p>For 2909_31_OD (Front Passenger Side Belt Tension Sensor Circuit Fault) ( LFC 7-13), GO to <u>W2</u> .</p> <p>For 2909_29_OD (Front Passenger Side Belt Tension Sensor Short to Ground) ( LFC 7-14), GO to <u>W4</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>W9</u> .</p>
<b>W2 CHECK THE BTS CIRCUITS FOR A SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li><li>• Disconnect: Passenger Seat Side Air Bag Module C316.</li><li>• Connect: Restraint System Diagnostic Tool 418-133 to Passenger Seat Side Air Bag Module C316.</li><li>• Disconnect: Passenger Safety Belt Buckle Switch and BTS C3066.</li><li>• Disconnect: OCSM C3043.</li><li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li><li>• Ignition ON.</li><li>• Measure the voltage between OCSM :<ul style="list-style-type: none"><li>◆ C3043-11, circuit 2088 (TN/RD), harness side and ground.</li><li>◆ C3043-13, circuit 2090 (DB/OG), harness side and ground.</li><li>◆ C3043-12, circuit 2089 (OG/BK), harness side and ground.</li></ul></li></ul> <div><p>N0003715</p></div> <ul style="list-style-type: none"><li>• <b>Is voltage present on any circuit?</b></li></ul>	<p><b>Yes</b> REPAIR circuit 2088 (TN/RD), circuit 2089 (OG/BK) or 2090 (DB/OG). GO to <u>W10</u> .</p> <p><b>No</b> GO to <u>W3</u> .</p>						
<p><b>W3 CHECK THE BTS CIRCUITS FOR AN OPEN</b></p>							
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li><li>• Measure the resistance between OCSM 3043, harness side and passenger safety belt buckle switch and BTS 3066, harness side using the following chart:</li></ul> <table><tr><th>OCSM</th><th>Circuit</th><th>Passenger Safety Belt Buckle Switch And BTS</th></tr><tr><td>C3043-11</td><td>2088 (TN/RD)</td><td>C3066-4</td></tr></table>	OCSM	Circuit	Passenger Safety Belt Buckle Switch And BTS	C3043-11	2088 (TN/RD)	C3066-4	<p><b>Yes</b> GO to <u>W5</u> .</p> <p><b>No</b> REPAIR circuit 2088 (TN/RD), 2089 (OG/BK) or 2090 (DB/OG). GO to <u>W10</u> .</p>
OCSM	Circuit	Passenger Safety Belt Buckle Switch And BTS					
C3043-11	2088 (TN/RD)	C3066-4					



C3043-13	2090 (DB/OG)	C3066-5
C3043-12	2089 (OG/BK)	C3066-6

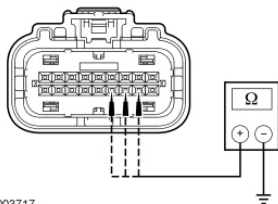


N0083332

- Are the resistances less than 0.5 ohm?

**W4 CHECK CIRCUITS 2088 (TN/RD), 2089 (OG/BK) AND 2090 (DB/OG) FOR A SHORT TO GROUND**

- Ignition OFF.
- Depower the SRS . Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Disconnect: Passenger Safety Belt Buckle and BTS C3066.
- Disconnect: OCSM C3043.
- Measure the resistance between OCSM :
  - ◆ C3043-11, circuit 2088 (TN/RD), harness side and ground.
  - ◆ C3043-12, circuit 2089 (OG/BK) harness side and ground
  - ◆ C3043-13, circuit 2090 (DB/OG), harness side and ground.



N0003717

- Are the resistances greater than 10,000 ohms?

**W5 CHECK FOR A SHORT BETWEEN CIRCUITS 2088 (TN/RD), 2089 (OG/BK) AND 2090 (DB/OG)**

- Measure the resistance between OCSM :
  - ◆ C3043-11, circuit 2088 (TN/RD), harness side and C3043-12, circuit 2089 (OG/BK), harness side.

**Yes**

GO to W5 .

**No**

REPAIR circuit 2088 (TN/RD), 2089 (OG/BK) or 2090 (DB/OG). GO to W10 .

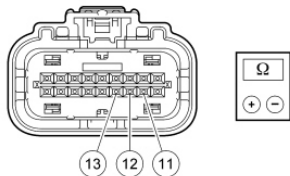
**Yes**

GO to W6 .

**No**

REPAIR circuit 2088 (TN/RD), 2090 (DB/OG) and/or 2089 (OG/BK). GO to W10 .

- ◆ C3043-11, circuit 2088 (TN/RD), harness side and C3043-13, circuit 2090 (DB/OG), harness side.
- ◆ C3043-12, circuit 2089 (OG/BK), harness side and C3043-13, circuit 2090 (DB/OG), harness side.

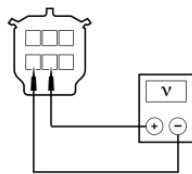


N0083334

- Are the resistances greater than 10,000 ohms?

**W6 CHECK THE OCSM OUTPUT**

- Connect: OCSM C3043 .
- Disconnect: Passenger Seat Side Air Bag Module C316.
- Connect: Restraint System Diagnostic Tool 418-133 to Passenger Seat Side Air Bag Module C316.
- Repower the SRS . **Do not** prove out the SRS at this time. Refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
- Ignition ON.
- Measure the voltage between BTS C3066-4, circuit 2088 (TN/RD), harness side and C3066-5, circuit 2090 (DB/OG), harness side.



N0072465

- Is voltage approximately 5 volts?

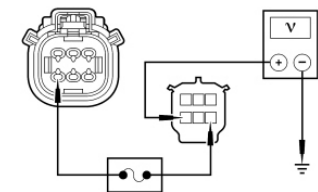
**Yes**GO to W7 .**No**INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section.GO to W10 .**W7 CHECK BTS VOLTAGE OUTPUT**

- Ignition OFF.
- Connect a fused jumper lead between passenger safety belt buckle switch and BTS C3066 pin 4, circuit 2088 (TN/RD), harness side and pin 4, circuit 2088

**Yes**GO to W8 .**No**INSTALL a new BTS . REFER to Section 501-20A . GO to W10 .

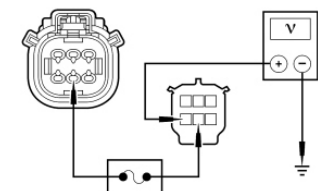
(TN/RD), component side.

- Connect a fused jumper lead between passenger safety belt buckle switch and BTS C3066 pin 5, circuit 2090 (DB/OG), harness side and pin 5, circuit 2090 (DB/OG), component side.
- Ignition ON.
- Measure the voltage between passenger safety belt buckle switch and BTS C3066 pin 4, circuit 2088 (TN/RD), harness side and pin 4, circuit 2088 (TN/RD), component side. and ground as you vary the tension of the BTS .



N0096114

- Measure the voltage between passenger safety belt buckle switch and BTS C3066 pin 5, circuit 2090 (DB/OG), harness side and pin 5, circuit 2090 (DB/OG), component side and ground as you vary the tension of the BTS .



N0096115

- **Does the voltage vary from approximately 0.95 volt with no tension applied to the sensor to approximately 3.8 volts with full tension applied to the sensor?**

#### W8 CONFIRM THE BTS FAULT

**NOTE:** Make sure all restraint system diagnostic tools, sensor electrical connectors, OCSM and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.

- Ignition OFF.

#### Yes

INSTALL a new OCS system service kit. REFER to Occupant Classification Sensor in this section. GO to W10 .

#### No

CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness.

<ul style="list-style-type: none"> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Connect: OCSM C3043 .</li> <li>• Connect: Passenger Safety Belt Buckle Switch and BTS C3066.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2909 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2909 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2909 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b></p> <p>REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>W10</u> .</p>
<b>W9 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All 2909 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view 2909 fault PIDs.</li> </ul> </li> <li>• <b>Do any 2909 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b></p> <p>The fault condition is now present. The fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p>For 2909_31_OD (Front Passenger Side Belt Tension Sensor Circuit Fault) ( LFC 7-13), GO to <u>W2</u> .</p> <p>For 2909_29_OD (Front Passenger Side Belt Tension Sensor Short to Ground) ( LFC 7-14), GO to <u>W4</u> .</p> <p><b>No</b></p> <p>CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness.</p> <p><b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b></p> <p>REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>W10</u> .</p>
<b>W10 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the</b></li> </ul>	<p><b>Yes</b></p> <p>Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test</p>

<p><b>backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></p> <ul style="list-style-type: none"> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p>direction.</p> <p><b>No</b></p> <p>CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>
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### Pinpoint Test X: DTC C1414

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Codes (LFCs) indicates the specific fault PIDs associated with DTC C1414:

LFC	Description
1-5	Restraints Control Module (RCM) Version Conflicts with Occupant Classification System (OCS) Version
Flashing (5Hz)	RCM in Plant Mode
11-3	RCM Version Conflicts with Passenger First Row Impact Sensor Version
11-2	RCM Version Conflicts with Driver First Row Impact Sensor Version
11-1	RCM Version Conflicts with Front Driver Impact Severity Sensor Version
12-1	RCM Version Conflicts with Front Passenger Impact Severity Sensor Version

#### Normal Operation

The Restraints Control Module (RCM) monitors the communication condition and circuits of the impact sensors and the Occupant Classification System (OCS) system for an embedded vehicle identification.

If the RCM receives conflicting information from the impact sensors or OCS system it will store DTC C1414 in memory and, depending on the fault, flash a LFC on the air bag warning indicator. The secondary air bag warning chime will also be activated.

Fault PIDs <sup>a</sup>	Description	Fault Trigger Condition
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1414_25_OD and 1414_25_CM	Row 1 Passenger Side Crash Sensor Mismatch	When the Restraints Control Module (RCM) senses incorrect sensor or sensor identification, a fault will be indicated.
1414_27_OD and 1414_27_CM	Row 1 Driver Side Crash Sensor Mismatch	When the RCM senses incorrect sensor or sensor identification, a fault will be indicated.
1414_28_OD and 1414_28_CM	Driver-Center Front Crash Sensor Mismatch	When the RCM senses incorrect sensor or sensor identification, a fault will be indicated.
1414_31_OD and 1414_31_CM	Occupant Classification Sensor CAN ID Mismatch	When the RCM receives incorrect identification from the Occupant Classification System Module (OCSM), a fault will be indicated.

<sup>a</sup> Fault PIDs that end in OD indicate an on-demand status and are associated with on-demand DTC C1414. Fault PIDs that end in CM indicate continuous memory status and are associated with continuous DTC C1414.

**This pinpoint test is intended to diagnose the following:**

- Incorrect RCM for vehicle
- Incorrect impact sensor information
- Incorrect OCS system for vehicle
- Wiring, terminals or connectors

**PINPOINT TEST X: DTC C1414**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>X1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All C1414 Fault PIDs.</li> </ul>	<p><b>Yes</b> The fault condition is still present. The fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate</p>

<ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view C1414 fault PIDs.</li> <li>• <b>Do any on-demand C1414 fault PIDs indicate a fault?</b></li> </ul>	<p>pinpoint test step.</p> <p>For 1414_31_OD (Occupant Classification Sensor CAN ID Mismatch) ( LFC 1-5), GO to <u>X2</u> .</p> <p>For 1414_25_OD (Row 1 Passenger Side Crash Sensor Mismatch), 1414_27_OD (Row 1 Driver Side Crash Sensor Mismatch) or 1414_28_OD (Driver-Center Front Crash Sensor Mismatch) ( LFC 12-1, 11-3, 11-2 or 11-1), GO to <u>X3</u> .</p> <p>For an RCM in plant mode fault (flashing at 5Hz), INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>X4</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>X6</u> .</p>
<b>X2 CHECK THE OCSM PART NUMBER</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Check the part number of the OCSM against the part number listed in the master parts catalog.</li> <li>• <b>Did the part number on the OCSM match the part number listed in the master parts catalog?</b></li> </ul>	<p><b>Yes</b> GO to <u>X4</u> .</p> <p><b>No</b> INSTALL a new OCS system service kit with the correct part number. REFER to <u>Occupant Classification Sensor</u> in this section. GO to <u>X7</u> .</p>
<b>X3 CHECK THE IMPACT SENSOR PART NUMBERS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Check the part number of the following impact sensors against the part number listed in the master parts catalog. <ul style="list-style-type: none"> <li>◆ LH front impact severity sensor</li> <li>◆ RH front impact severity sensor</li> <li>◆ Passenger side impact sensor</li> <li>◆ Driver side impact sensor</li> </ul> </li> <li>• <b>Did the part numbers of the sensors match the part numbers listed in the master parts catalog?</b></li> </ul>	<p><b>Yes</b> GO to <u>X4</u> .</p> <p><b>No</b> INSTALL a new sensor with the correct part number. REFER to the appropriate sensor replacement procedure in this section. GO to <u>X7</u> .</p>
<b>X4 CHECK THE RCM PART NUMBER</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and</u></li> </ul>	<p><b>Yes</b> GO to <u>X5</u> .</p> <p><b>No</b></p>

<p><u>Repowering</u> in this section.</p> <ul style="list-style-type: none"> <li>• Check the part number of the RCM against the part number listed in the master parts catalog.</li> <li>• <b>Did the part number of the RCM match the part number listed in the master parts catalog?</b></li> </ul>	<p>INSTALL a new RCM with the correct part number. REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>X7</u> .</p>
<b>X5 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1414 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>X7</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>X7</u> .</p>
<b>X6 CHECK FOR INTERMITTENT FAULTS</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - RCM - View and Record All C1414 Fault PIDs. <ul style="list-style-type: none"> <li>◆ Refer to PID list in Normal Operation to view C1414 fault PIDs.</li> </ul> </li> <li>• <b>Do any on-demand C1414 fault PIDs indicate a fault?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. The fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test.</p> <p>Using the fault PIDs recorded, GO to the appropriate pinpoint test step.</p> <p>For 1414_31_OD (Occupant Classification Sensor CAN ID Mismatch) ( LFC 1-5), GO to <u>X2</u> .</p> <p>For 1414_25_OD (Row 1 Passenger Side Crash Sensor Mismatch), 1414_27_OD (Row 1 Driver Side Crash Sensor Mismatch) or 1414_28_OD (Driver-Center Front Crash Sensor Mismatch) ( LFC 12-1, 11-3, 11-2 or 11-1), GO to <u>X3</u> .</p> <p>For an RCM in plant mode fault (flashing at 5Hz), INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>X4</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this</b></p>



	<b>time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>X7</u> .
<b>X7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.  <b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.

### Pinpoint Test Y: DTC C1946

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC C1946:

- LFC 4-9 - Front Driver's Seat Track Position Switch Circuit Open

#### Normal Operation

The seat track position sensor informs the Restraints Control Module (RCM) of the driver seat position.

The RCM monitors the driver seat track position sensor circuits. If the RCM detects an open circuit fault, it will store DTC C1946 in memory, flash a LFC on the air bag warning indicator.

- DTC C1946 (Driver Seat Track Position Sensor Circuit Open) - If the RCM detects an open on the driver seat track position sensor circuit, it will set this DTC.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Driver seat track position sensor
- RCM

**PINPOINT TEST Y: DTC C1946**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

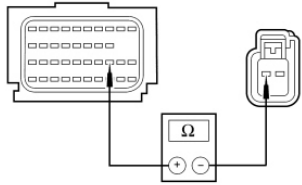
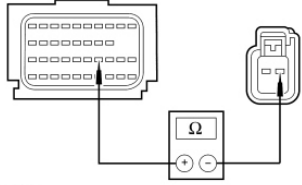
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>Y1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC C1946 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Y2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>Y6</u> .</p>
<b>Y2 CHECK CIRCUIT 1520 (LG) FOR AN OPEN BETWEEN THE RCM AND DRIVER SEAT TRACK POSITION SENSOR</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: Driver Seat Track Position Sensor C358.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Measure the resistance between RCM C310b-23, circuit 1520 (LG), harness side and driver seat track position sensor C358-2, circuit 1520 (LG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>Y3</u> .</p> <p><b>No</b> REPAIR circuit 1520 (LG). GO to <u>Y7</u> .</p>

 <p>A0048716</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	
<p><b>Y3 CHECK CIRCUIT 1558 (TN/BK) FOR AN OPEN BETWEEN THE RCM AND DRIVER SEAT TRACK POSITION SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between RCM C310b-24, circuit 1558 (TN/BK), harness side and driver seat track position sensor C358-1, circuit 1558 (TN/BK), harness side.</li> </ul>  <p>A0048717</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>Y4</u> .</p> <p><b>No</b> REPAIR circuit 1558 (TN/BK). GO to <u>Y7</u> .</p>
<p><b>Y4 CHECK THE SEAT TRACK POSITION SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Connect: RCM C310a and C310b.</li> <li>• Install a known good driver seat track position sensor. Refer to <u>Seat Position Sensor</u> in this section.</li> <li>• Connect: Seat Track Position Sensor C358.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1946 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> GO to <u>Y5</u> .</p> <p><b>No</b> Fault corrected. GO to <u>Y7</u> .</p>
<p><b>Y5 CONFIRM THE RCM FAULT</b></p>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be</p>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>Y7</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault.</p>

<p>recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original driver seat track position sensor.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1946 retrieved on-demand during self-test?</b></li> </ul>	<p>ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Y7</u> .</p>
<b>Y6 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1946 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Y2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Y7</u> .</p>
<b>Y7 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

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| <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul> |  |
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### Pinpoint Test Z: DTC C1947

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC C1947:

- LFC 7-3 - Front Driver's Seat Track Position Switch Circuit Short to Ground

#### Normal Operation

The seat track position sensor informs the Restraints Control Module (RCM) of the driver seat position.

The RCM monitors the driver seat track position sensor circuits. If the RCM detects a short to ground, it will store DTC C1947 in memory, flash LFC 7-3 on the air bag warning indicator.

- DTC C1947 (Front Driver's Seat Track Position Switch Circuit Short to Ground) - If the RCM detects a short to ground on the driver seat track position sensor circuit, it will set this DTC.

#### **This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Driver seat track position sensor
- RCM

#### PINPOINT TEST Z: DTC C1947

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

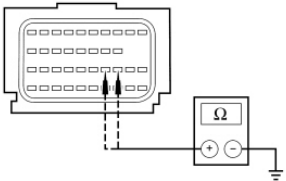
**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>Z1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC C1947 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Z2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>Z5</u> .</p>
<b>Z2 CHECK CIRCUITS 1520 (LG) AND 1558 (TN/BK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Disconnect: RCM C310a and C310b.</li> <li>Disconnect: Seat Track Position Sensor C358.</li> <li>Measure the resistance between RCM : <ul style="list-style-type: none"> <li>◆ C310b-23, circuit 1520 (LG), harness side and ground.</li> <li>◆ C310b-24, circuit 1558 (TN/BK), harness side and ground.</li> </ul> </li> </ul>  <p>A0041594</p> <ul style="list-style-type: none"> <li><b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>Z3</u> .</p> <p><b>No</b> REPAIR circuit 1520 (LG) or 1558 (TN/BK). GO to <u>Z6</u> .</p>
<b>Z3 CHECK THE SEAT TRACK POSITION SENSOR</b>	
<ul style="list-style-type: none"> <li>Connect: RCM C310a and C310b.</li> <li>Install a known good driver seat track position sensor. Refer to <u>Seat Position Sensor</u> in this section.</li> <li>Repower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Ignition ON.</li> </ul>	<p><b>Yes</b> GO to <u>Z4</u> .</p> <p><b>No</b> Fault corrected. GO to <u>Z6</u> .</p>

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1947 retrieved on-demand during self-test?</b></li> </ul>	
<b>Z4 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Reinstall the original seat track position sensor.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1947 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <u>Z6</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Z6</u> .</p>
<b>Z5 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1947 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>Z2</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>Z6</u> .</p>
<b>Z6 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS .</p>

<ul style="list-style-type: none"> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	REPAIR is complete. RETURN the vehicle to the customer.
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### Pinpoint Test AA: DTC C1948

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Lamp Fault Codes (LFCs)

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC C1948:

- LFC 7-7 - Front Driver's Seat Track Position Switch Circuit Resistance Out of Range

#### Normal Operation

The seat track position sensor informs the Restraints Control Module (RCM) of the driver seat position.

The RCM monitors the driver seat track position sensor circuits. If the RCM detects a current out of range condition, it will store DTC C1948 in memory, flash a LFC 7-7 on the air bag warning indicator.

- DTC C1948 (Front Driver's Seat Track Position Switch Circuit Resistance Out of Range) - If the RCM detects a current out of range between forward and rearward on the driver seat track position switch, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Driver seat track position sensor
- RCM

#### PINPOINT TEST AA: DTC C1948

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.




**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>AA1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC C1948 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <a href="#">AA2</a> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <a href="#">AA3</a> .</p>
<b>AA2 CHECK THE SEAT TRACK POSITION SENSOR</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Install a known good driver seat track position sensor. Refer to <u>Seat Position Sensor</u> in this section.</li> <li>Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>Ignition ON.</li> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC C1948 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Restraints Control Module (RCM)</u> in this section. GO to <a href="#">AA4</a> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <a href="#">AA4</a> .</p>
<b>AA3 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li><b>Was DTC C1948 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <a href="#">AA2</a> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other</p>

	systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>AA4</u> .
<b>AA4 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>•  <b>WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b> CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

**Pinpoint Test AB: DTC C1982**

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

**Lamp Fault Codes (LFCs)**

The following Lamp Fault Code (LFC) indicates the specific fault associated with DTC C1982:

- LFC 7-11 - Front Driver's Seat Track Position Switch Circuit Short to Battery

**Normal Operation**

The seat track position sensor informs the Restraints Control Module (RCM) of the driver seat position.

The RCM monitors the driver seat track position sensor circuits. If the RCM detects a short to voltage, it will store DTC C1982 in memory, flash LFC 7-11 on the air bag warning indicator.

- DTC C1982 (Front Driver's Seat Track Position Switch Circuit Short to Battery) - If the RCM detects a short to battery on the driver seat track position sensor circuit, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Seat track position sensor
- RCM

**PINPOINT TEST AB: DTC C1982**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

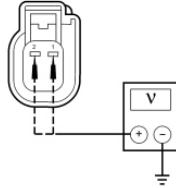
**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** SRS components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the Pinpoint Test.

Test Step	Result / Action to Take
<b>AB1 RETRIEVE SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1982 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is still present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>AB2</u> .</p> <p><b>No</b> This is an intermittent fault when present as a CMDTC only (DTC not retrieved on demand). The fault condition is not present at this time. GO to <u>AB4</u> .</p>
<b>AB2 CHECK CIRCUITS 1520 (LG) AND 1558 (TN/BK) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Disconnect: Seat Track Position Sensor C358.</li> <li>• Repower the SRS . <b>Do not</b> prove out the</li> </ul>	<p><b>Yes</b> REPAIR circuit 1520 (LG) or 1558 (TN/BK). GO to <u>AB5</u> .</p> <p><b>No</b> GO to <u>AB3</u> .</p>

<p>SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between driver seat track position sensor C358-2, circuit 1520 (LG), harness side and ground, and driver seat track position sensor C358-1, circuit 1558 (TN/BK), harness side and ground.</li> </ul>  <p>A0030671</p> <ul style="list-style-type: none"> <li>• <b>Is voltage present on either circuit?</b></li> </ul>	
<b>AB3 CONFIRM THE RCM FAULT</b>	
<p><b>NOTE:</b> Make sure all restraint system diagnostic tools, sensor electrical connectors and the RCM electrical connectors are connected before carrying out the self test. If not, DTCs will be recorded.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Install the original driver seat track position sensor. Refer to <u>Seat Position Sensor</u> in this section.</li> <li>• Repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1982 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <u>Driver Air Bag Module</u> in this section. GO to <u>AB5</u> .</p> <p><b>No</b> CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test.</b> REPAIR any intermittent wiring, terminals or connector concerns found. GO to <u>AB5</u> .</p>
<b>AB4 CHECK FOR AN INTERMITTENT FAULT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Was DTC C1982 retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b> The fault condition is now present. This fault cannot be cleared until it is corrected and the DTC is no longer retrieved on-demand during self test. GO to <u>AB2</u> .</p>

	<p><b>No</b></p> <p>CHECK for causes of the intermittent fault. ATTEMPT to recreate the hard fault by flexing the wire harness and cycling the ignition key frequently. ACTIVATE other systems in the same wire harness. <b>Do not install any new SRS components at this time. SRS components should only be installed when directed to do so in the pinpoint test. REPAIR</b> any intermittent wiring, terminals or connector concerns found. GO to <b>AB5</b> .</p>
<b>AB5 CHECK FOR ADDITIONAL SRS DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>⚠ WARNING: Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.</b></li> <li>• Reconnect all SRS components (if previously disconnected).</li> <li>• If previously directed to depower the SRS , repower the SRS . <b>Do not</b> prove out the SRS at this time. Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - RCM .</li> <li>• <b>Are any DTCs retrieved on-demand during self-test?</b></li> </ul>	<p><b>Yes</b></p> <p>Do not clear any DTCs until all DTCs have been resolved. GO to the Supplemental Restraint System (SRS) DTC Chart in this section for pinpoint test direction.</p> <p><b>No</b></p> <p>CLEAR all CMDTCs . PROVE OUT the SRS . REPAIR is complete. RETURN the vehicle to the customer.</p>

### Pinpoint Test AC: DTC B1317/B1318

Refer to Wiring Diagrams Cell **46** , Supplemental Restraint System for schematic and connector information.

**NOTE:** DTCs B1317, B1318 or B1676 can be set if the vehicle has been recently jump started, the battery has been recently charged or the battery has been discharged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if the battery has been left unattended with the accessories on.

### Normal Operation - Restraints Control Module (RCM)

The Restraints Control Module (RCM) continuously monitors the input voltage for correct operation. If the RCM detects input voltage below 9 volts, it will store DTC B1318 in memory. If the RCM detects input voltage of 20 volts, it will store DTC B1317 in memory. If the RCM sets DTC B1317 or B1318, it will send a message to the Instrument Cluster (IC) module to illuminate the air bag warning indicator.

- DTC B1317 (Battery Voltage High) - If the RCM detects voltage above 17.5 volts, it will set this DTC.

- DTC B1318 (Battery Voltage Low) - If the RCM detects voltage below 9 volts, it will set this DTC.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- RCM
- Occupant Classification System Module (OCSM)

#### PINPOINT TEST AC: DTC B1317/B1318

**⚠ WARNING:** Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.

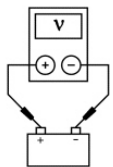
**NOTICE:** Use the correct probe adapter(s) from the Flex Probe Kit when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** Supplemental Restraint System (SRS) components should only be disconnected or reconnected when instructed to do so within a pinpoint test step. Failure to follow this instruction may result in incorrect diagnosis of the SRS .

**NOTE:** The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

Test Step	Result / Action to Take
<b>AC1 RETRIEVE ALL CMDTCs IN ALL MODULES</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - ALL CMDTC .</li> <li>• <b>Is DTC B1317, B1318 or B1676 present in one or more modules AND P0563, P0620, P0625, P0626 or P065B retrieved from the PCM?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose the charging system.</p> <p><b>No</b> GO to <a href="#">AC2</a> .</p>
<b>AC2 TEST BATTERY CONDITION</b>	
<p><b>NOTE:</b> DTCs B1317, B1318 or B1676 can be set if the vehicle has been recently jump started, the battery has been recently charged or the battery has been discharged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if the battery has been left unattended with the accessories on.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Carry out the battery condition test. Refer to <a href="#">Section 414-01</a> .</li> <li>• <b>Did the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> If the battery passed the condition test but required a recharge, REFER to <a href="#">Section 414-00</a> to diagnose the charging system. CLEAR all CMDTCs . TEST the system for normal operation.</p> <p>If the battery passed the condition test and did not require a recharge, GO to <a href="#">AC3</a> .</p> <p><b>No</b> INSTALL a new battery. CLEAR all CMDTCs . TEST the</p>

	SRS for normal operation.
<b>AC3 CHECK CHARGING SYSTEM VOLTAGE</b>	
<p><b>NOTE:</b> Do not allow the engine speed to increase above 2,000 rpm while performing this step or the generator may self excite and result in default charging system output voltage. If engine speed goes above 2,000 rpm, shut the vehicle OFF and restart the engine before performing this step.</p> <ul style="list-style-type: none"> <li>• Measure the voltage of the battery: <ul style="list-style-type: none"> <li>♦ For DTC B1317, turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes while measuring battery voltage.</li> <li>♦ For DTC B1318, turn on headlights and HVAC fan on high and run engine at 1,500 rpm for a minimum of 2 minutes while measuring battery voltage.</li> </ul> </li> </ul>  <p style="text-align: center;">AJ0210-A</p> <ul style="list-style-type: none"> <li>• Is voltage between 13 and 15.2 volts?</li> </ul>	<p><b>Yes</b> For DTC B1318, GO to <a href="#">AC4</a> .  For DTC B1317, GO to <a href="#">AC6</a> .</p> <p><b>No</b> REFER to <a href="#">Section 414-00</a> to diagnose the charging system. CLEAR all CMDTCs . TEST the SRS for normal operation.</p>
<b>AC4 CHECK FOR OPEN IGNITION CIRCUIT TO THE MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <a href="#">Supplemental Restraint System (SRS) Depowering and Repowering</a> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> <li>• Measure the resistance between RCM C310a-12, circuit 937 (RD/WH), harness side, and Central Junction Box (CJB) fuse 2 (10A).</li> <li>• Is the resistance less than 1 ohm?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AC5</a> .</p> <p><b>No</b> REPAIR the circuit as necessary. CLEAR all CMDTCs . TEST the SRS for normal operation.</p>
<b>AC5 CHECK FOR OPEN GROUND TO THE MODULE</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the RCM C310a-16, circuit 676 (PK/OG) and a good ground.</li> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AC6</a> .</p> <p><b>No</b> REPAIR circuit 676 (PK/OG) as necessary.</p> <p>CLEAR all CMDTCs . TEST the SRS for normal operation.</p>
<b>AC6 CHECK FOR MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Depower the SRS . Refer to <a href="#">Supplemental Restraint System (SRS) Depowering and Repowering</a> in this section.</li> <li>• Disconnect: RCM C310a and C310b.</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <a href="#">Restraints Control Module (RCM)</a> in this section.</p>

<ul style="list-style-type: none"> <li>• Check for the following:                             <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ damaged pins.</li> <li>◆ pushed-out pins.</li> </ul> </li> <li>• Connect the RCM C310a and C310b and make sure the connector seats correctly.</li> <li>• Repower the SRS . Refer to <u>Supplemental Restraint System (SRS) Depowering and Repowering</u> in this section.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>No</b></p> <p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR all CMDTCs . TEST the SRS for normal operation.</p>
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**Supplemental Restraint System (SRS) Depowering and Repowering**

Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**Depowering Procedure**

**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** To reduce the risk of accidental deployment, do not use any memory saver devices. Failure to follow this instruction may result in serious personal injury or death.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Turn all vehicle accessories OFF.
2. Turn the ignition to OFF.
3. At the Central Junction Box (CJB), located on the LH end of the instrument panel, open the kick panel cover and remove the RCM fuse 22 (10A) from the CJB . For additional information, refer to the Wiring Diagram Manual.
4. Turn the ignition ON and monitor the air bag warning indicator for at least 30 seconds. The air bag warning indicator will remain lit continuously (no flashing) if the correct RCM fuse has been removed. If the air bag warning indicator does not remain lit continuously, remove the correct RCM fuse before proceeding.
5. Turn the ignition OFF.
6. **⚠ WARNING:** Always deplete the backup power supply before repairing or installing any new front or side air bag supplemental restraint system (SRS) component and before servicing, removing, installing, adjusting or striking components near the front or side impact sensors or the restraints control module (RCM). Nearby components include doors, instrument panel, console, door latches, strikers, seats and hood latches.

**Refer to the Description and Operation portion of Section 501-20B for location of the RCM and impact sensor(s).**

**To deplete the backup power supply energy, disconnect the battery ground cable and wait at least 1 minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).**

**Failure to follow these instructions may result in serious personal injury or death in the event of an accidental deployment.**

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to Section 414-01 .

### Repowering Procedure

1. **⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.**

Make sure all restraint system diagnostic tool(s) that may have been installed during the repair have been removed from the vehicle and all SRS components are connected.

2. Turn the ignition from OFF to ON.
3. Install the RCM fuse 22 (10A) to the CJB and close the cover.
4. **⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.**

Connect the battery ground cable. For additional information, refer to Section 414-01 .

5. Prove out the SRS as follows:

Turn the ignition from ON to OFF. Wait 10 seconds, then turn the ignition back to ON and monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will light continuously for approximately 6 seconds and then turn off. If an air bag SRS fault is present, the air bag warning indicator will:

- fail to light.
- remain lit continuously.
- flash.

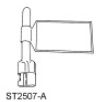


The flashing might not occur until approximately 30 seconds after the ignition has been turned from the OFF to the ON position. This is the time required for the RCM to complete the testing of the SRS . If the air bag warning indicator is inoperative and a SRS fault exists, a chime will sound in a pattern of 5 sets of 5 beeps. If this occurs, the air bag warning indicator and any SRS fault discovered must be diagnosed and repaired.

Clear all continuous DTCs from the RCM using a scan tool.



**Supplemental Restraint System (SRS) Deactivation and Reactivation**

## Special Tool(s)

	Diagnostic Tool, Restraint System (2 required) 418-133
	Diagnostic Tool, Restraint System (4 required) 418-F395
	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Deactivation**

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** To reduce the risk of accidental deployment, do not use any memory saver devices. Failure to follow this instruction may result in serious personal injury or death.

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Turn all vehicle accessories OFF.
2. Turn the ignition to OFF.
3. At the Central Junction Box (CJB), located below the LH side of the instrument panel, remove the cover and the RCM fuse 22 (10A) from the CJB . For additional information, refer to the Wiring Diagram Manual.
4. Turn the ignition ON and monitor the air bag warning indicator for at least 30 seconds. The air bag warning indicator will remain lit continuously (no flashing) if the correct RCM fuse has been removed. If the air bag warning indicator does not remain lit continuously, remove the correct RCM fuse before proceeding.

5. Turn the ignition OFF.

6. **⚠ WARNING:** Always deplete the backup power supply before repairing or installing any new front or side air bag supplemental restraint system (SRS) component and before servicing, removing, installing, adjusting or striking components near the front or side impact sensors or the restraints control module (RCM). Nearby components include doors, instrument panel, console, door latches, strikers, seats and hood latches.

Refer to the Description and Operation portion of **Section 501-20B** for location of the RCM and impact sensor(s).

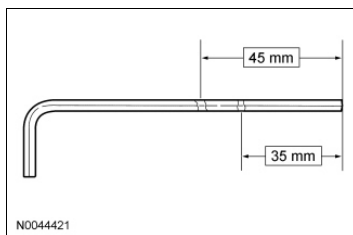
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least 1 minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

**Failure to follow these instructions may result in serious personal injury or death in the event of an accidental deployment.**

Disconnect the battery ground cable and wait at least one minute. For additional information, refer to **Section 414-01**.

7. **NOTE:** A tool that has a blunt end, such as a 4.0 mm (0.15 in) Allen wrench, is better able to disengage the steering wheel spring clip from the driver air bag module locking pins.

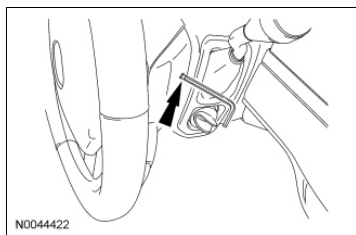
Using a 4 mm (0.15 in) Allen wrench or suitable tool, place 2 marks on the tool as an aid to remove the driver air bag module. One mark should be approximately 35 mm (1.37 in) from the end of the tool with the second mark approximately 45 mm (1.77 in) from the end of the tool.



8. **NOTE:** The steering wheel rear cover has internal guides that assist in directing the tool to the correct location. Allow the steering wheel rear cover to guide the tool, minimal force is needed.

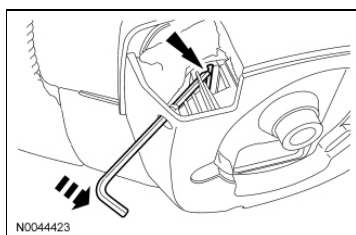
**Gently** insert the tool into a steering wheel rear cover upper access hole until the end of the tool comes into contact with an obstruction. The 45 mm (1.77 in) mark on the tool should be even or close to even with the steering wheel rear cover. If the 45 mm (1.77 in) mark on the tool is not even or close to even with the steering wheel rear cover, remove the tool from the steering wheel and carry out the step once again to correctly position the tool.

- If the 45 mm (1.77 in) mark on the tool goes into the steering wheel rear cover, the tool was directed past the steering wheel spring clip. Use a tool of a slightly larger diameter or, using the internal guides of the steering wheel rear cover, insert the tool to the 45 mm (1.77 in) mark and proceed to the next step.



9. **NOTE:** The steering wheel is removed for clarity. The upper corner of the steering wheel rear cover is cut away to show the internal guides and the steering wheel spring clip.

With the tool correctly positioned, remove the tool approximately 2-3 mm (0.07-0.11 in) from the access hole then gently push the tool forward (toward front of vehicle). This puts the tool in the best position to disengage the steering wheel spring clip from the driver air bag module locking pin.

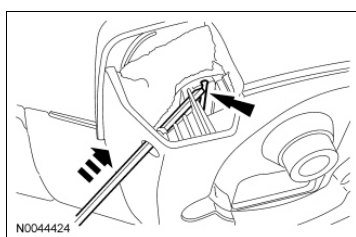


10. **NOTE:** Make sure to disengage the steering wheel spring clip from the driver air bag module locking pin before gently pulling the corresponding corner of the driver air bag module. No or very little force is needed to separate the corresponding corner of the driver air bag module from the steering wheel once the spring clip is disengaged from the locking pin.

**NOTE:** When the steering wheel spring clip is disengaged from the first locking pin, the corresponding corner of the driver air bag module will only separate 2-4 mm (0.07-0.15 in) from the steering wheel. The driver air bag module will separate more noticeably as subsequent locking pins are disengaged.

Push the tool deeper into the access hole (approximately 4-8 mm [0.15-0.31 in]) with enough force to disengage the steering wheel spring clip from the driver air bag module locking pin. The corresponding corner of the driver air bag module should pop up once the spring clip is disengaged from the locking pin. **Gently** pull the corresponding corner of the driver air bag module to make sure the locking pin does not reengage the spring clip. Remove the tool from the access hole. Discontinue pulling on the corresponding corner of the driver air bag module.

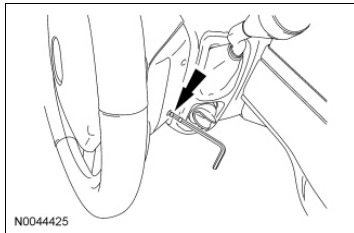
- If the corresponding corner of the driver air bag module does not easily separate from the steering wheel, the spring clip is not disengaged from the locking pin. Repeat the necessary steps to correctly position the tool and disengage the spring clip from the locking pin.



11. **NOTE:** The steering wheel rear cover has internal guides that assist in directing the tool to the correct location. Allow the steering wheel rear cover to guide the tool, minimal force is needed.

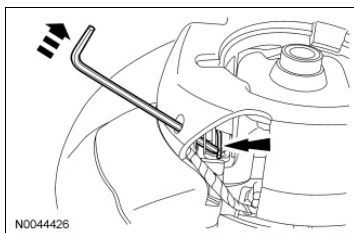
Working on the same side of the steering wheel, **gently** insert the tool into a steering wheel rear cover lower access hole until the end of the tool comes into contact with an obstruction. The 35 mm (1.37 in) mark on the tool should be even or close to even with the steering wheel cover. If the 35 mm (1.37 in) mark on the tool is not even or close to even with the steering wheel cover, remove the tool from the access hole and carry out the step once again to correctly position the tool.

- If the 35 mm (1.37 in) mark on the tool goes into the steering wheel rear cover, the tool was directed past the steering wheel spring clip. Use a tool of a slightly larger diameter or, using the internal guides of the steering wheel rear cover, insert the tool to the 35 mm (1.37 in) mark and proceed to the next step.



12. **NOTE:** The steering wheel is removed for clarity. The lower corner of the steering wheel rear cover is cut away to show the internal guides and the steering wheel spring clip.

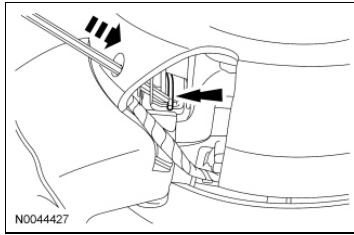
With the tool correctly positioned, remove the tool approximately 2-3 mm (0.07-0.11 in) from the access hole then gently push the tool forward (toward front of vehicle). This puts the tool in the best position to disengage the steering wheel spring clip from the driver air bag module locking pin.



13. **NOTE:** Make sure to disengage the steering wheel spring clip from the driver air bag module locking pin before gently pulling the corresponding corner of the driver air bag module. No or very little force is needed to separate the corresponding corner of the driver air bag module from the steering wheel once the spring clip is disengaged from the locking pin.

Push the tool deeper into the access hole (approximately 3-6 mm [0.11-0.23 in]) with enough force to disengage the steering wheel spring clip from the driver air bag module locking pin. The corresponding corner of the driver air bag module should pop up once the spring clip is disengaged from the locking pin. **Gently** pull the corresponding corner of the driver air bag module to make sure the locking pin does not reengage the spring clip. Remove the tool from the access hole. Discontinue pulling on the corresponding corner of the driver air bag module.

- If the corresponding corner of the driver air bag module does not easily separate from the steering wheel the spring clip is not disengaged from the locking pin. Repeat the necessary steps to correctly position the tool and disengage the spring clip from the locking pin.



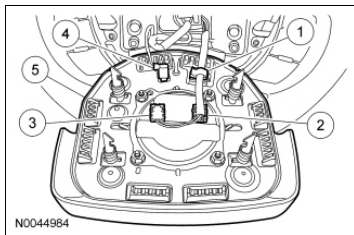
14. **NOTE:** Disengage the steering wheel spring clips from the 2 locking pins on one side of the driver air bag module before proceeding to the other side.

Repeat the above steps to disengage the 2 remaining driver air bag module locking pins.

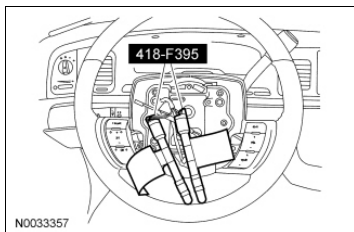
15. **NOTE:** The driver air bag electrical connectors cannot be reversed at installation. Note the electrical connectors position for installation.

Disconnect and remove the driver air bag module.

1. Release the driver air bag module electrical wiring from the driver air bag wiring clip.
2. Squeeze the tabs and disconnect the driver air bag module electrical connector.
3. Squeeze the tabs and disconnect the driver air bag module electrical connector.
4. Disconnect the horn electrical connector.
5. Remove the driver air bag module.

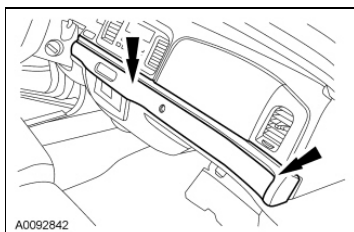


16. Attach a Restraint System Diagnostic Tool to each of the clockspring electrical connectors at the top of the steering column.



17. Separate the RH instrument panel trim panel.

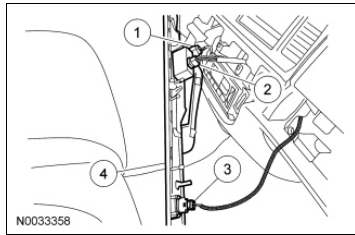
- Pull out to release the retaining clips.
- Slide the RH instrument panel trim panel slightly to the right, aligning the keyway.
- Pull out, separating the RH instrument panel trim panel.





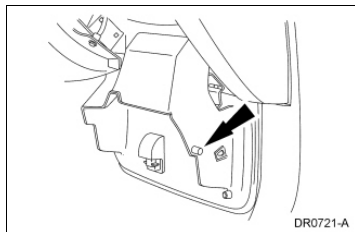
18. Remove the trim panel.

1. Disconnect the rear window defrost switch electrical connector.
2. If equipped, disconnect the clock electrical connector.
3. Disconnect the Passenger Air Bag Deactivation (PAD) indicator.
4. Remove the RH instrument panel trim panel.

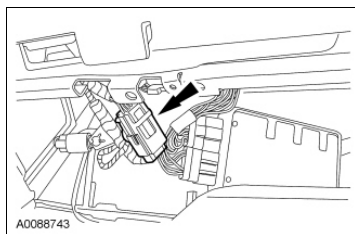


19. Disconnect the glove compartment isolator.

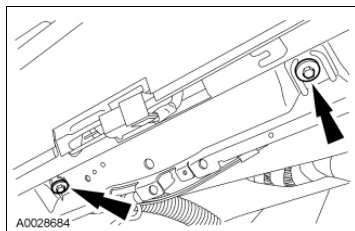
20. While pushing in on the 2 glove compartment door tabs, position the glove compartment downward.



21. Looking up into the front center of the glove compartment opening, separate the passenger air bag module electrical connector and pin-type retainer from the bracket. Disconnect the passenger air bag module electrical connector.



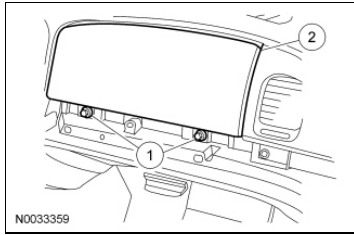
22. Through the glove compartment opening, remove the 2 passenger air bag module bolts.



23. **NOTICE:** Do not handle the passenger air bag module by grabbing the edges of the deployment doors. Damage to the air bag module may occur.

Remove the passenger air bag module.

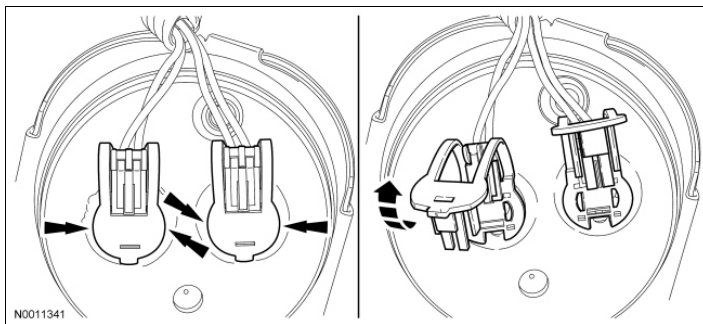
1. Remove the 2 passenger air bag module bolts.
2. Placing one hand in the glove compartment opening, push the passenger air bag module out and remove it.



**24. NOTICE: Care must be taken to prevent damage to the passenger air bag module electrical connectors and locking inserts.**

Gently pry each side of the passenger air bag module jumper harness electrical connector locking insert, working alternately side to side, until the locking insert separates from the electrical connector.

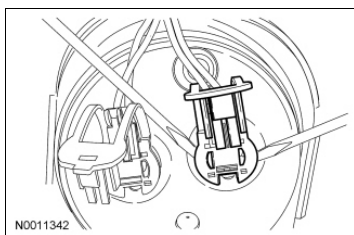
- Repeat to separate the locking insert from the remaining passenger air bag module jumper harness electrical connector.



**25. NOTICE: Care must be taken to prevent damage to the passenger air bag module electrical connectors.**

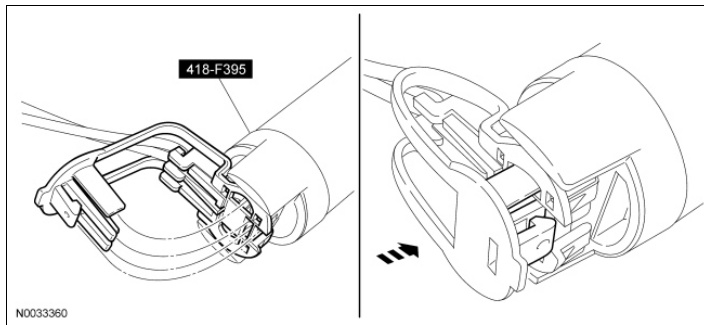
Using suitable tools (such as small screwdrivers), carefully depress the 2 locking tabs on the side of the passenger air bag module jumper harness electrical connector and disconnect the electrical connector.

- Repeat to disconnect the remaining passenger air bag module jumper harness electrical connector and remove the passenger air bag module jumper harness from the passenger air bag module.

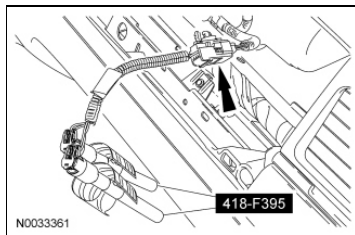


**26. NOTICE: Carefully align the locking inserts to the electrical connectors or damage may result.**

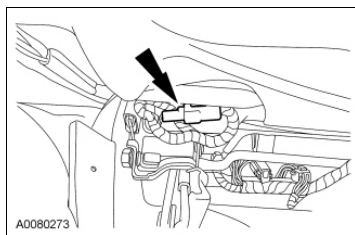
Attach a Restraint System Diagnostic Tool to each of the 2 passenger air bag module jumper harness electrical connectors and align and install the locking inserts to the electrical connectors.



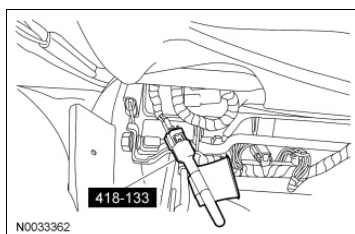
27. Connect the passenger air bag module jumper harness to the passenger air bag module electrical connector on the vehicle wiring harness.



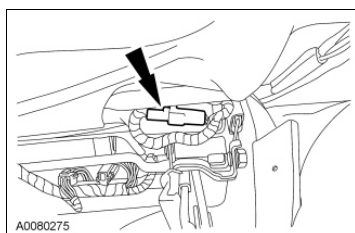
28. Disconnect the passenger seat side air bag module electrical connector, located at the lower rear of the seat cushion pan.



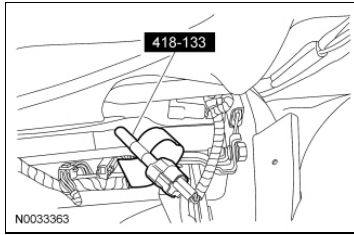
29. Attach the Restraint System Diagnostic Tool to the seat harness side of the passenger seat side air bag module electrical connector.



30. Disconnect the driver seat side air bag module electrical connector, located at the lower rear of the seat cushion pan.



31. Attach the Restraint System Diagnostic Tool to the seat harness side of the driver seat side air bag module electrical connector.



32. Install the RCM fuse 22 (10A) to the CJB .

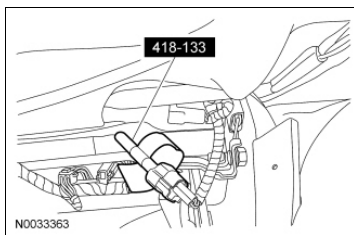
33. Connect the battery ground cable. For additional information, refer to [Section 414-01](#) .

## Reactivation

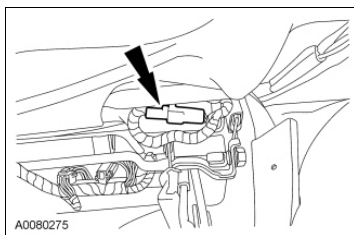
1. Remove the RCM fuse 22 (10A) from the CJB .

2. Disconnect the battery ground cable and wait at least one minute. For additional information, refer to [Section 414-01](#) .

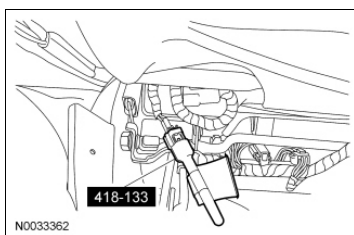
3. Remove the Restraint System Diagnostic Tool from the driver seat side air bag electrical connector.



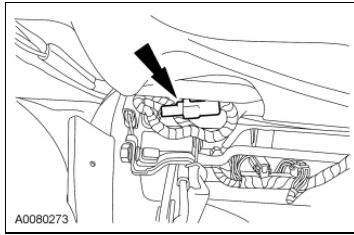
4. Connect the driver seat side air bag module electrical connector, located at the lower rear of the seat cushion pan.



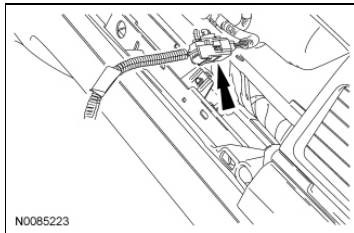
5. Remove the Restraint System Diagnostic Tool from the passenger seat side air bag electrical connector.



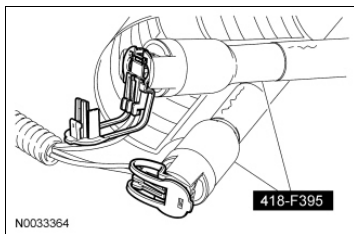
6. Connect the passenger seat side air bag module electrical connector, located at the lower rear of the seat cushion pan.



7. Disconnect the passenger air bag module jumper harness from the passenger air bag module electrical connector on the vehicle wiring harness.



8. Separate the locking inserts and remove the Restraint System Diagnostic Tool from each of the passenger air bag module jumper harness electrical connectors.

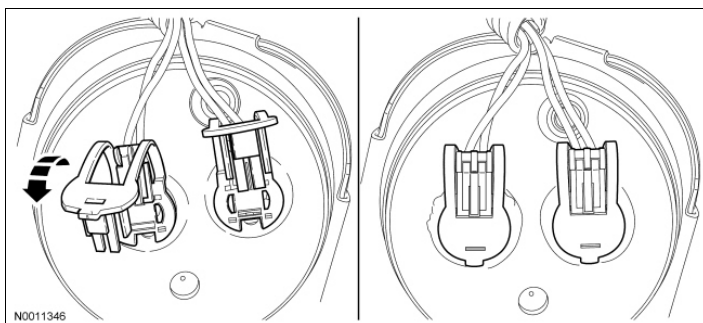


9. **NOTICE:** The passenger air bag module jumper harness electrical connectors are unique and cannot be reversed when connected to the passenger air bag module. Match the electrical connector key to the keyway in the passenger air bag module. Do not force the electrical connectors into the passenger air bag module. Failure to follow this instruction may result in component damage or system failure.

**NOTICE:** Care must be taken when connecting the passenger air bag module electrical connectors to prevent damage to the electrical connector terminals and the passenger air bag module pins.

**NOTICE:** Carefully align the locking inserts to the electrical connectors or damage may result.

Align and connect the passenger air bag module jumper harness electrical connectors to the passenger air bag module and install the locking inserts.

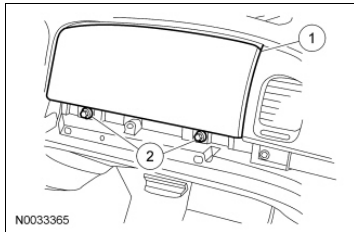


10. Make sure the J-nuts on the passenger air bag module are fully seated into the slots.

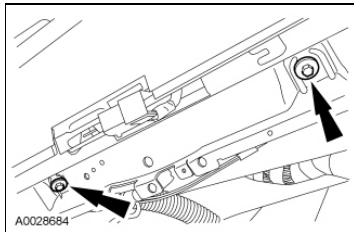
11. **NOTICE: Do not handle the passenger air bag module by grabbing the edges of the deployment doors. Damage to the air bag module may occur.**

Install the passenger air bag module into the instrument panel.

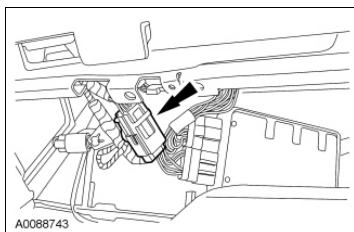
1. Position the passenger air bag module into the instrument panel.
2. Install the 2 bolts.
  - ◆ Tighten to 3 Nm (27 lb-in).



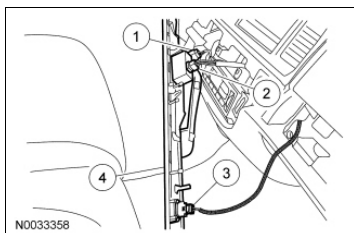
12. Through the glove compartment opening, install the 2 passenger air bag module bolts.
- Tighten to 9 Nm (80 lb-in).



13. Connect the passenger air bag module electrical connector and attach the pin-type retainer to the bracket.

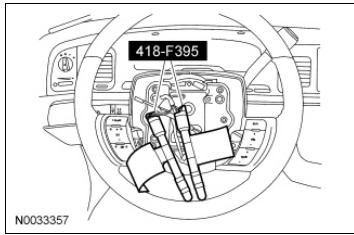


14. Install the RH instrument panel trim panel.
1. Connect the rear window defrost switch electrical connector.
  2. If equipped, connect the clock electrical connector.
  3. Connect the PAD indicator.
  4. Align the retaining clips, slide the trim panel to the left and push in, seating the retaining clips.



15. Connect the glove compartment isolator.

16. Remove the Restraint System Diagnostic Tool from each of the clockspring electrical connectors at the top of the steering column.

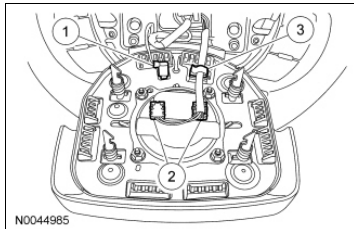


17. Connect the driver air bag module.

1. Connect the horn electrical connector.
2. **NOTICE:** The clockspring electrical connectors are unique and cannot be reversed when connected to the driver air bag module. Match the electrical connector key to the keyway in the driver air bag module. Do not force the electrical connectors into the driver air bag module. Damage to the connector or component may occur.

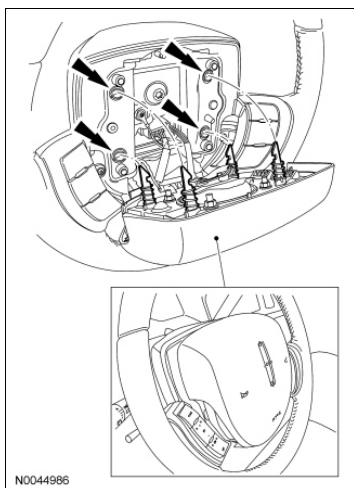
Connect the driver air bag module electrical connectors as noted during removal.

3. Install the driver air bag module electrical wiring into the driver air bag wiring clip.

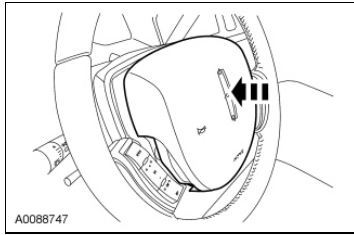


18. **NOTE:** With the driver air bag module held as close to the steering wheel as possible, take up the slack in the wiring by gently tucking any excess length into the pocket at the bottom of the steering wheel before rocking the driver air bag module into place.

Align the 4 driver air bag module locking pins to the openings in the steering wheel and position the driver air bag module in place.



19. With the locking pins aligned and the driver air bag module positioned to the steering wheel, push inward, seating the 4 locking pins to the spring clips.
  - An audible click should be heard when the driver air bag module locking pins are seated in place to the spring clip. When the 4 locking pins are seated in place, there should be an even uniform gap between the driver air bag module trim cover and the steering wheel.



20. **⚠ WARNING: Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.**

Make sure all Restraint System Diagnostic Tool(s) that may have been installed during the repair have been removed from the vehicle and all SRS components are connected.

21. Turn the ignition from OFF to ON.
22. Install the RCM fuse 22 (10A) to the CJB and install the cover.
23. **⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.**

Connect the battery ground cable. For additional information, refer to [Section 414-01](#) .

24. Prove out the SRS as follows:

Turn the ignition from ON to OFF. Wait 10 seconds, then turn the ignition back to ON and monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will light continuously for approximately 6 seconds and then turn off. If an air bag SRS fault is present, the air bag warning indicator will:

- fail to light.
- remain lit continuously.
- flash.

The flashing might not occur until approximately 30 seconds after the ignition has been turned from the OFF to the ON position. This is the time required for the RCM to complete the testing of the SRS . If the air bag warning indicator is inoperative and a SRS fault exists, a chime will sound in a pattern of 5 sets of 5 beeps. If this occurs, the air bag warning indicator and any SRS fault discovered must be diagnosed and repaired.

Clear all continuous DTCs from the RCM using a scan tool.





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**Inspection and Repair After a Supplemental Restraint System (SRS) Deployment**

**⚠ WARNING:** Remove restraint system diagnostic tools from the vehicle prior to road testing. If tools are not removed, the supplemental restraint system (SRS) device may not deploy in a crash. Failure to follow this instruction may result in serious personal injury or death in a crash and possibly violate vehicle safety standards.

**NOTE:** After diagnosing or repairing a Supplemental Restraint System (SRS), the restraint system diagnostic tools (if required) must be removed before operating the vehicle over the road.

**NOTE:** Deployable devices (such as air bag modules, pretensioners) may deploy alone or in various combinations depending on the impact event.

**NOTE:** Always refer to the appropriate workshop manual procedures prior to carrying out vehicle repairs affecting the SRS and safety belt system.

**NOTE:** The SRS must be fully operational and free of faults before releasing the vehicle to the customer.

**All vehicles**

1. **NOTE:** Refer to the correct removal and installation procedure for all SRS components being installed.

When any deployable device or combination of devices have deployed and/or the Restraints Control Module (RCM) has DTC B1231/B1193:00 (Event Threshold Exceeded) in memory, the repair of the vehicle SRS is to include the removal of all deployed devices and the installation of new deployable devices, the removal and installation of new impact sensors and the removal and installation of a new RCM. DTCs must be cleared from all required modules after repairs are carried out.

**Vehicles with Occupant Classification System (OCS) system**

2. **NOTE:** After installation of new Occupant Classification System (OCS) components, carry out the Occupant Classification System (OCS) System Reset procedure as instructed in the workshop manual. Refer to the appropriate workshop manual for OCS system removal and installation procedure.

When a vehicle has been involved in a collision and the Occupant Classification System Module (OCSM) has DTC B1231/B1193:00 stored in memory, the repair of the OCS system is to include the following procedures for the specified system:

- For rail-type OCS system, inspect the passenger side floorpan for damage and repair as necessary. Install new OCS system rails. Do not install a new OCSM unless DTC B1231 cannot be cleared.
- For weight sensor bolt-type OCS system, inspect the passenger side floorpan for damage and repair as necessary. Install a new seat track with OCS system weight sensor bolts. DTC must be cleared from the OCSM before carrying out Occupant Classification System (OCS) System Reset. Do not install a new OCSM unless DTC B1231/B1193:00 cannot be cleared.
- For bladder-type OCS system, inspect for damage and repair as necessary. If installation of an OCS system component is required, an OCS system service kit must be installed.

**All vehicles**

3. When any damage to the impact sensor mounting points or mounting hardware has occurred, repair or install new mounting points and mounting hardware as needed.
  4. When the driver air bag module has deployed, a new clockspring must be installed.
  5. New driver and/or front passenger safety belt systems (including retractors, buckles and height adjusters) must be installed if the vehicle is involved in a collision that results in deployment of the driver and/or front passenger safety belt pretensioners. For additional information, refer to Section 501-20A .
  6. Inspect the entire vehicle for damage, including the following components:
    - Steering column (deployable column if equipped)
    - Instrument panel knee bolsters and mounting points
    - Instrument panel braces and brackets
    - Instrument panel and mounting points
    - Seats and seat mounting points
    - Safety belts, safety belt buckles and safety belt retractors. For additional information, refer to Section 501-20A .
    - SRS wiring, wiring harnesses and connectors
  7. After carrying out the review and inspection of the entire vehicle for damage, repair or install new components as needed.
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## Pyrotechnic Device Disposal

### Disposal of Deployable Devices and Pyrotechnic Devices That are Undeployed/Inoperative

**NOTE:** All inoperative air bag modules and safety belt pretensioners have been placed on the Mandatory Return List. All discolored or damaged air bag modules must be treated the same as any inoperative live air bag being returned.

1. Depower the Supplemental Restraint System (SRS). For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. Remove the undeployed/inoperative device. For additional information, refer to the appropriate procedure in this section or Section 501-20A .
3. **NOTE:** When installing a new air bag module, a prepaid return postcard is provided with the replacement air bag module. The serial number for the new part and the Vehicle Identification Number (VIN) must be recorded and sent to Ford Motor Company.

If installing a new air bag module, record the necessary information and return the inoperative air bag module to Ford Motor Company.

### Disposal of Deployable Devices and Pyrotechnic Devices That Are Deployed

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. Remove the deployed device. For additional information, refer to the appropriate procedure in this section or Section 501-20A .
3. **NOTE:** If a dual stage driver or passenger air bag module has deployed due to a crash event, the air bag module requires manual deployment to make sure both stages have deployed before scrapping the vehicle or disposing of the air bag module. To determine if a vehicle is equipped with dual stage driver or passenger air bag modules, refer to the Description and Operation portion of this section.

Dispose of the deployed device in the same manner as any other part to be scrapped.

### Disposal of Deployable Devices and Pyrotechnic Devices That Require Manual Deployment

1. Safety and environmental concerns require consideration and treatment of restraints system deployable and pyrotechnic devices when disposing of vehicles, deployable devices or pyrotechnic devices. Deploying deployable and pyrotechnic devices before scrapping a vehicle or the device eliminates the potential for hazardous exposures or reactions during processing. If special handling procedures are followed, deployable and pyrotechnic devices can be deployed safely and recycled with the vehicle, shipped separately to a recycling facility or disposed of safely.

**NOTE:** To determine the deployable devices a vehicle is equipped with, refer to the Description and Operation portion of this section.

A vehicle equipped with any of the following deployable devices requires manual deployment of the devices before scrapping the vehicle or component. For additional information, refer to the appropriate portion of this procedure.

- Driver air bag module
- Passenger air bag module
- Seat side air bag modules
- Safety Canopy® modules
- Side air curtain modules

2. **NOTE:** To determine the pyrotechnic devices a vehicle is equipped with, refer to the Description and Operation portion of this section.

A vehicle equipped with any of the following pyrotechnic devices requires manual deployment of the devices before scrapping the vehicle or component. For additional information, refer to the appropriate portion of this procedure.

- Safety belt buckle pretensioners
- Safety belt retractor pretensioners
- Adaptive load-limiting retractors
- Deployable steering column

3. **NOTE:** To determine if a vehicle is equipped with dual stage driver or passenger air bag modules, refer to the Description and Operation portion of this section.

If a dual stage driver or passenger air bag module has deployed due to a crash event, the air bag module requires manual deployment to make sure both stages have deployed before scrapping the vehicle or disposing of the air bag module. For additional information, refer to Driver Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules - Remote Deployment in this procedure.

### **Driver Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules - Remote Deployment**

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** Always carry or place a live air bag module with the air bag and deployment door/trim cover/tear seam pointed away from the body. Do not set a live air bag module down with the deployment door/trim cover/tear seam face down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

**⚠ WARNING:** Always carry or place a live Safety Canopy®, or side air curtain module, with the module and tear seam pointed away from your body. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.

**⚠ WARNING:** Deploy all supplemental restraint system (SRS) devices (air bags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when an SRS device is deployed, hearing protection is

**required. Failure to follow these instructions may result in serious personal injury.**

**NOTE:** For air bag modules with multiple loops, all the loops on the air bag module must be deployed.

**NOTE:** Some driver and passenger front air bags have 2 deployment stages. After a collision it is possible that Stage 1 has deployed and Stage 2 has not.

If a front air bag module has deployed, it is **mandatory** that the front air bag module be remotely deployed using the appropriate air bag disposal procedure.

**NOTE:** A typical air bag disposal is shown that is similar for all vehicles.

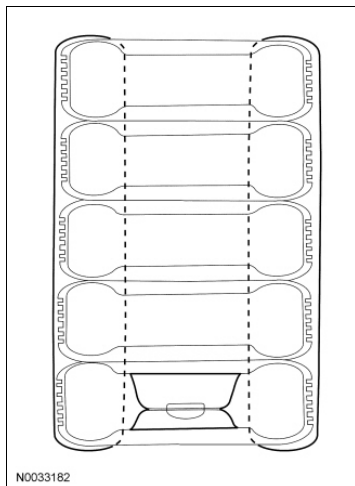
#### **All driver, passenger and seat side air bag modules**

1. Make a container to house the air bag module for deployment.

- **NOTE:** The tires must be of sufficient size to accommodate the air bag module.

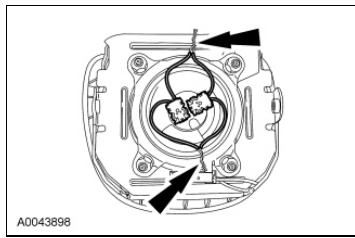
Obtain a tire and wheel assembly and an additional 4 tires (without wheels) of the same size.

- With the tire and wheel assembly on the bottom, stack the tires.
- Securely tie all of the tires together.

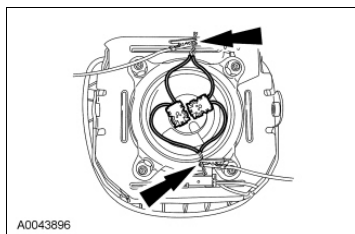


2. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
3. Remove the air bag module. For additional information, refer to the appropriate procedure in this section.
4. **NOTE:** If the air bag module does not have a hard-wired pigtail, it will be necessary to cut the wires and connector(s) from the vehicle wire harness and reconnect to the air bag module.  
  
Cut each of the air bag module wires near the electrical connector that connects to the vehicle wire harness.
5. Remove any sheathing (if present) and strip the insulation from the ends of the cut wires.
6. **NOTE:** Typical driver air bag module with 2 loops shown, other air bag modules with multiple loops similar.

For air bag modules with multiple loops, twist together a wire from each loop then repeat for the remaining wires from each loop.



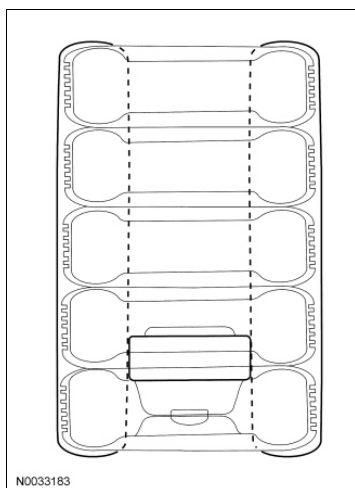
7. Make a jumper harness to deploy the air bag module.
  - Obtain 2 wires (20 gauge minimum) at least 9.14 m (30 ft) long and strip both ends of each wire.
  - At one end of the jumper harness, connect the wires together.
8. Using the end of the jumper harness where the wires are not connected together, attach each wire of the jumper harness to each wire of the air bag module or to the twisted-together wires if multiple loops. Use tape or other insulating material to make sure that the leads do not make contact with each other.



### Driver air bag modules

9. **NOTE:** Make sure to maintain the connections to the air bag module.

With the stack of tires upright and the wheel on the bottom, carefully place the driver air bag module, with the trim cover facing up, on the wheel.

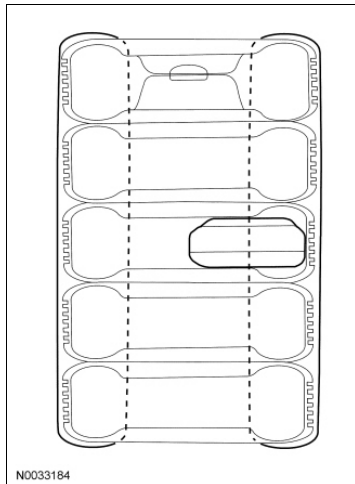


### Passenger and seat side air bag modules

10. **NOTE:** Make sure to maintain the connections to the air bag module.

Tip the stack of tires on its side and place the air bag module inside the center tire, making sure that there are 2 tires beneath the tire containing the air bag module and 2 tires (including the tire and wheel assembly) above the tire containing the air bag module.

11. Place the tire stack upright, with the wheel on top.



### All driver, passenger and seat side air bag modules

12. Remain at least 9.14 m (30 ft) away from the air bag module.
13. From the end of the jumper harness that is not connected to the air bag module, disconnect the 2 wires of the jumper harness from each other.
14. Deploy the air bag module by touching the ends of the 2 wires of the jumper harness to the terminals of a 12-volt battery.
15. To allow for cooling, wait at least 10 minutes before approaching the deployed air bag module.
16. Dispose of the deployed air bag module in the same manner as any other part to be scrapped.

### Safety Belt Buckle Pretensioners, Safety Belt Retractor Pretensioners and Adaptive Load Limiting Safety Belt Retractors - Remote Deployment

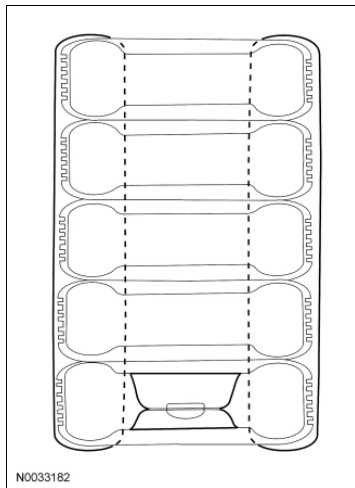
**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

**⚠ WARNING:** Deploy all supplemental restraint system (SRS) devices (air bags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when an SRS device is deployed, hearing protection is required. Failure to follow these instructions may result in serious personal injury.

**NOTE:** A typical safety belt buckle and retractor disposal is shown that is similar for all vehicles.

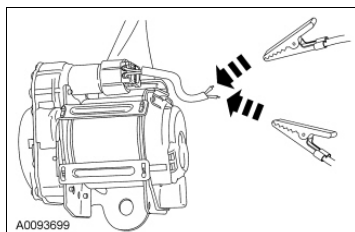
1. Make a container to house the safety belt buckle or retractor for deployment.
  - **NOTE:** The tires must be of sufficient size to accommodate the safety belt buckle or retractor.
  - Obtain a tire and wheel assembly and an additional 4 tires (without wheels) of the same size.
  - With the tire and wheel assembly on the bottom, stack the tires.
  - Securely tie all of the tires together.





2. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
3. Remove the safety belt buckle or retractor. For additional information, refer to the appropriate procedure in Section 501-20A .
  - When deploying a safety belt buckle pretensioner, install a nut and bolt of sufficient length and of the same diameter as was used to retain it to the seat.
4. **NOTE:** If the safety belt buckle or retractor does not have a hard-wired pigtail, it will be necessary to cut the wires and connector(s) from the vehicle wire harness and reconnect to the safety belt buckle or retractor.  
  
Cut each of the safety belt buckle or retractor wires near the electrical connector that connects to the vehicle wire harness.
5. Remove any sheathing (if present) and strip the insulation from the ends of the cut wires.
6. Make a jumper harness to deploy the safety belt buckle or retractor.
  - Obtain 2 wires (20 gauge minimum) at least 9.14 m (30 ft) long and strip both ends of each wire.
  - At one end of the jumper harness, connect the wires together.
7. **NOTE:** Typical safety belt retractor pretensioner shown, other safety belt buckle pretensioners and load-limiting retractors similar.

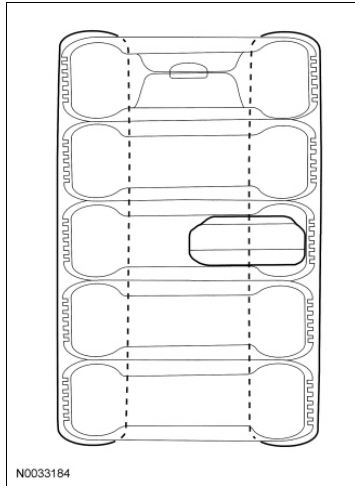
Using the end of the jumper harness that the wires are not connected together, attach each wire of the jumper harness to each wire of the safety belt buckle or retractor. Use tape or other insulating material to make sure that the leads do not make contact with each other.



8. **NOTE:** Make sure to maintain the connections to the safety belt buckle or retractor.

Tip the stack of tires on its side and place the safety belt buckle or retractor inside the center tire, making sure that there are 2 tires beneath the tire containing the safety belt buckle or retractor and 2 tires (including the tire and wheel assembly) above the tire containing the safety belt buckle or retractor.

9. Place the tire stack upright, with the wheel on top.



10. Remain at least 9.14 m (30 ft) away from the safety belt buckle or retractor.
11. From the end of the jumper harness that is not connected to the safety belt buckle or retractor, disconnect the 2 wires of the jumper harness from each other.
12. Deploy the safety belt buckle or retractor by touching the ends of the 2 wires of the jumper harness to the terminals of a 12-volt battery.
13. To allow for cooling, wait at least 10 minutes before approaching the deployed safety belt buckle or retractor.
14. Dispose of the deployed safety belt buckle or retractor in the same manner as any other part to be scrapped.

#### **Safety Belt Buckle Pretensioners, Safety Belt Retractor Pretensioners and Load Limiting Safety Belt Retractors - In-Vehicle Deployment**

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

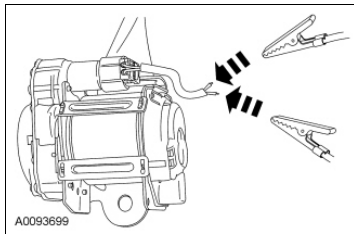
**⚠ WARNING:** Deploy all supplemental restraint system (SRS) devices (air bags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when an SRS device is deployed, hearing protection is required. Failure to follow these instructions may result in serious personal injury.

**NOTE:** A typical safety belt buckle and retractor disposal is shown that is similar for all vehicles.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

2. Access the safety belt buckle or retractor electrical connectors. For additional information, refer to Section 501-20A.
3. Cut each of the safety belt buckle or retractor wires, leaving at least 101.6 mm (4 in) to work with.
4. Remove any sheathing (if present) and strip the insulation from the ends of the cut wires.
5. Make a jumper harness to deploy the safety belt buckle or retractor.
  - Obtain 2 wires (20 gauge minimum) at least 9.14 m (30 ft) long and strip both ends of each wire.
  - At one end of the jumper harness, connect the wires together.
6. **NOTE:** Typical safety belt retractor pretensioner shown, other safety belt buckle pretensioners and load-limiting retractors are similar.

Using the end of the jumper harness that the wires are not connected together, attach each wire of the jumper harness to each wire of the safety belt buckle or retractor. Use tape or other insulating material to make sure that the leads do not make contact with each other.



7. Remain at least 9.14 m (30 ft) away from the safety belt buckle or retractor.
8. From the end of the jumper harness that is not connected to the safety belt buckle or retractor, disconnect the 2 wires of the jumper harness from each other.
9. Deploy the safety belt buckle or retractor by touching the ends of the 2 wires of the jumper harness to the terminals of a 12-volt battery.
10. To allow for cooling, wait at least 10 minutes before approaching the deployed safety belt buckle or retractor.
11. Dispose of the deployed safety belt buckle or retractor in the same manner as any other part to be scrapped.

### Safety Canopy® Modules and Side Air Curtain Modules - In-Vehicle Deployment

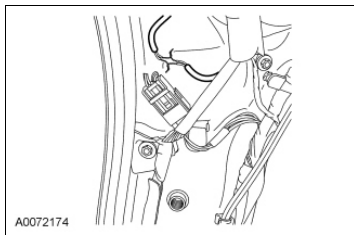
**⚠ WARNING:** Deploy all supplemental restraint system (SRS) devices (air bags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when an SRS device is deployed, hearing protection is required. Failure to follow these instructions may result in serious personal injury.

**NOTE:** The Safety Canopy® module deployment for a scrapped vehicle will occur in its installed position in the vehicle.

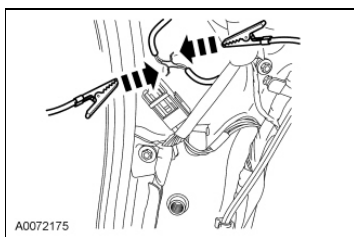
**NOTE:** A typical Safety Canopy® module disposal is shown that is similar for all vehicles.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. Access the Safety Canopy®/side air curtain module electrical connectors. For additional information, refer to the appropriate procedure in this section.
3. Cut each of the Safety Canopy®/side air curtain module wires leaving at least 101.6 mm (4 in) to work with.
4. Remove any sheathing (if present) and strip the insulation from the ends of the cut wires.
5. **NOTE:** Typical Safety Canopy®/side air curtain module with 2 loops shown, other Safety Canopy®/side air curtain modules with 2 loops are similar.

For Safety Canopy®/side air curtain modules with multiple loops, twist together a wire from each loop then repeat for the remaining wires from each loop.



6. Make a jumper harness to deploy the Safety Canopy®/side air curtain module.
  - Obtain 2 wires (20 gauge minimum) at least 9.14 m (30 ft) long and strip both ends of each wire.
  - At one end of the jumper harness, connect the wires together.
7. Using the end of the jumper harness where the wires are not connected together, attach each wire of the jumper harness to each wire of the Safety Canopy®/side air curtain module or to the twisted-together wires if multiple loops. Use tape or other insulating material to make sure that the leads do not make contact with each other.



8. From the end of the jumper harness that is not connected to the Safety Canopy®/side air curtain module, disconnect the 2 wires of the jumper harness from each other.
9. Deploy the Safety Canopy®/side air curtain module by touching the ends of the 2 wires of the jumper harness to the terminals of a 12-volt battery.
10. To allow for cooling, wait at least 10 minutes before approaching the deployed Safety Canopy®/side air curtain module.
11. Dispose of the deployed Safety Canopy®/side air curtain module in the same manner as any other part to be scrapped.

## Deployable Steering Column - In-Vehicle Deployment

**⚠ WARNING:** Deploy all supplemental restraint system (SRS) devices (air bags, pretensioners, load limiters, etc.) outdoors with all personnel at least 9.14 meters (30 feet) away to make sure of personal safety. Due to the loud report which occurs when an SRS device is deployed, hearing protection is required. Failure to follow these instructions may result in serious personal injury.

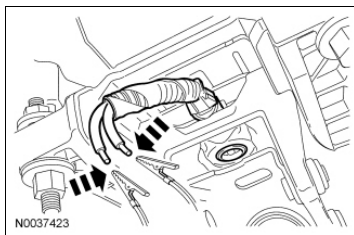
1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. **NOTE:** It may be necessary to lower or remove the deployable steering column from the instrument panel to access the deployable steering column electrical connector.

Access the deployable steering column electrical connector.

3. **NOTE:** If the deployable steering column does not have a hard-wired pigtail, it will be necessary to cut the wires and connector(s) from the vehicle wire harness and reconnect to the deployable steering column.

Cut each of the deployable steering column wires, leaving at least 101.6 mm (4 in) to work with.

4. Remove any sheathing (if present) and strip the insulation from the ends of the cut wires.
5. Make a jumper harness to deploy the deployable steering column.
  - Obtain 2 wires (20 gauge minimum) at least 9.14 m (30 ft) long and strip both ends of each wire.
  - At one end of the jumper harness, connect the wires together.
6. Using the end of the jumper harness where the wires are not connected together, attach each wire of the jumper harness to each wire of the deployable steering column. Use tape or other insulating material to make sure that the leads do not make contact with each other.



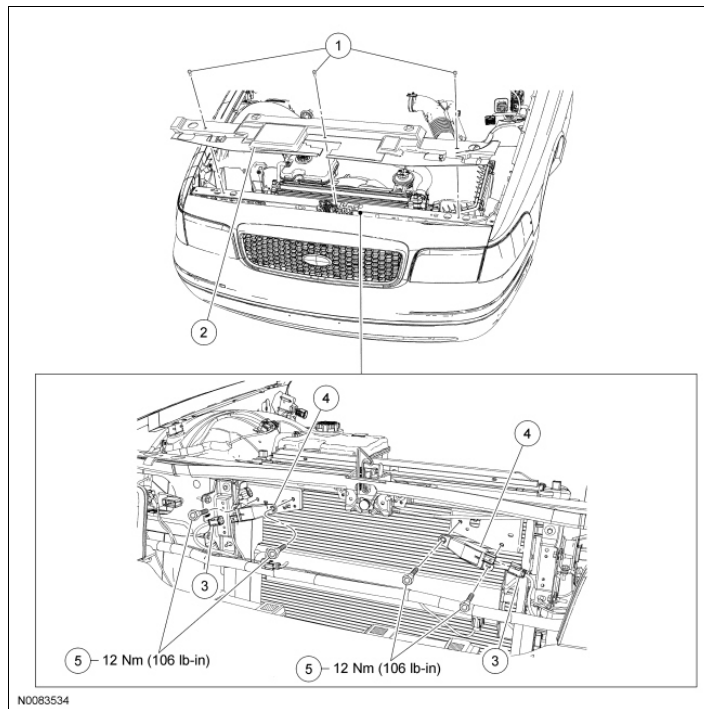
7. Remain at least 9.14 m (30 ft) away from the deployable steering column.
8. From the end of the jumper harness that is not connected to the deployable steering column, disconnect the 2 wires of the jumper harness from each other.
9. Deploy the deployable steering column by touching the ends of the 2 wires of the jumper harness to the terminals of a 12-volt battery.
10. To allow for cooling, wait at least 10 minutes before approaching the deployed steering column.
11. Dispose of the deployed steering column in the same manner as any other part to be scrapped.



SECTION 501-20B: Supplemental Restraint  
System  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

### Front Impact Severity Sensor



Item	Part Number	Description
1	-	Pin-type retainers
2	8C291	Radiator upper shield
3	-	Front impact severity sensor electrical connectors (part of 14290)
4	14B006	Front impact severity sensors
5	W707935	Front impact severity sensor bolts

#### Removal and Installation

**⚠ WARNING:** If a vehicle has been in a crash, inspect the restraints control module (RCM) and the impact sensor (if equipped) mounting areas for deformation. If damaged, restore the mounting areas to the original production configuration. A new RCM and sensors must be installed whether or not the air bags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. Remove the 3 pin-type retainers and radiator upper shield.

3. Disconnect the electrical connector.
  4. Remove the 2 bolts and front impact severity sensor.
    - To install, tighten to 12 Nm (106 lb-in).
  5. **⚠ WARNING: Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.**
- NOTE:** Make sure the radiator core support and front impact severity sensor mating surfaces are clean and free of foreign material.
- To install, reverse the removal procedure.
6. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
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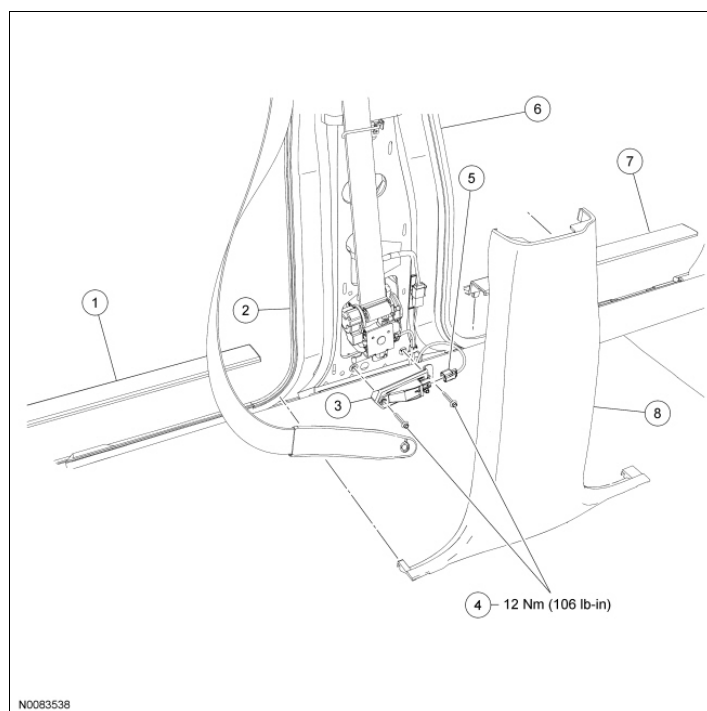


SECTION 501-20B: Supplemental Restraint  
System  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

## Side Impact Sensor

**NOTE:** RH shown, LH similar.



Item	Part Number	Description
1	13228	Rear door scuff plate
2	25325	Rear door B-pillar weatherstripping
3	14B345	Side impact sensor and bracket
4	W707935	Side impact sensor bolts
5	-	Side impact sensor electrical connector (part of 14A005)
6	20709	Front door B-pillar weatherstripping
7	13208	Front door scuff plate
8	24347	Lower B-pillar trim panel

### Removal

**⚠ WARNING:** If a vehicle has been in a crash, inspect the restraints control module (RCM) and the impact sensor (if equipped) mounting areas for deformation. If damaged, restore the mounting areas to the original production configuration. A new RCM and sensors must be installed whether or not the air bags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.

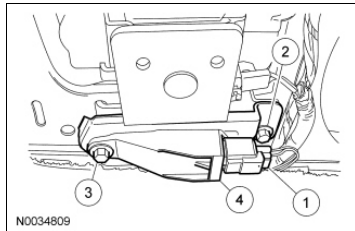
**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
2. Remove the front door scuff plate.
3. Remove the rear door scuff plate.
4. Release the front and rear door B-pillar weatherstripping.
5. Pull out to release the retaining clips and remove the lower B-pillar trim panel.
6. **NOTE:** The side impact sensor bolts must be removed in the sequence shown.

Remove the side impact sensor with bracket.

1. Disconnect the electrical connector.
2. Remove the bolt.
3. Remove the bolt.
4. Remove the side impact sensor with bracket.



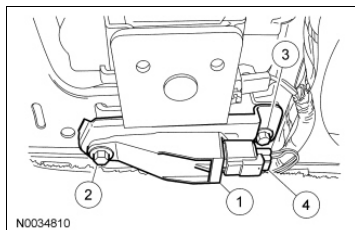
## Installation

1. **⚠ WARNING:** Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.

**NOTE:** The side impact sensor bolts must be installed in the sequence shown.

Install the side impact sensor with bracket.

1. Position the side impact sensor with bracket.
2. Install the bolt.
  - ◆ Tighten to 12 Nm (106 lb-in).
3. Install the bolt.
  - ◆ Tighten to 12 Nm (106 lb-in).
4. Connect the electrical connector.




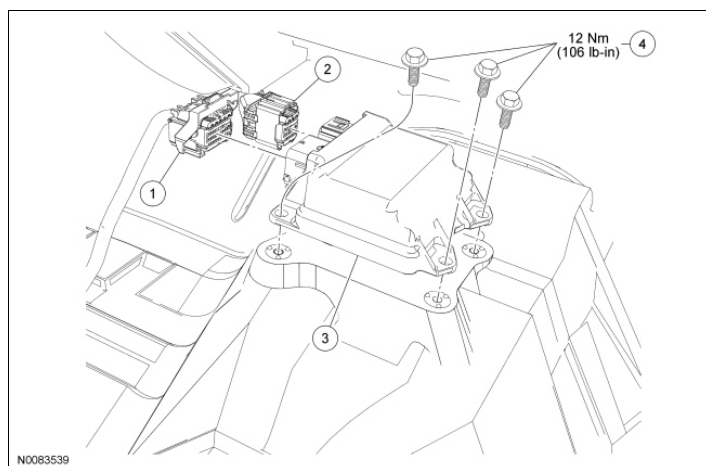
2. Align the lower B-pillar lower trim panel and push in, seating the retaining clips.

3. Attach the front and rear door B-pillar weatherstripping.
  4. Install the rear door scuff plate.
  5. Install the front door scuff plate.
  6. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
-

**Restraints Control Module (RCM)**

## Special Tool(s)

 ST2834-A	<b>Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS)</b> software with appropriate hardware, or equivalent scan tool
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Item	Part Number	Description
1	-	Large Restraints Control Module (RCM) connector (part of 14A005)
2	-	Small RCM connector (part of 14401)
3	14B321	RCM
4	W707935	RCM bolts

**Removal**

**⚠ WARNING:** If a vehicle has been in a crash, inspect the restraints control module (RCM) and the impact sensor (if equipped) mounting areas for deformation. If damaged, restore the mounting areas to the original production configuration. A new RCM and sensors must be installed whether or not the air bags have deployed. Failure to follow these instructions may result in serious personal injury or death in a crash.

**⚠ WARNING:** Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

### All vehicles

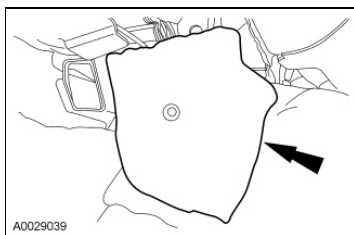
1. If installing a new RCM , carry out the steps necessary to prepare for Programmable Module Installation (PMI). For additional information, refer to Section 418-01 .

### Vehicles with floor shifter

2. Apply the parking brake and place the transmission in position 1.

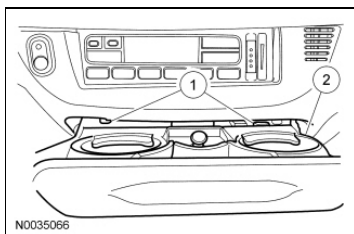
### All vehicles

3. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
4. Remove the pin-type retainer and the carpet patch.

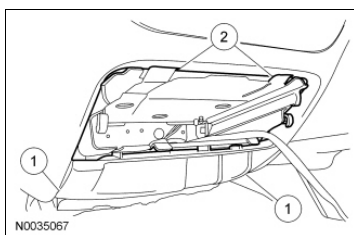


### Vehicles with column shifter

5. Remove the ashtray.
  1. Release the tabs.
  2. Remove the ashtray.

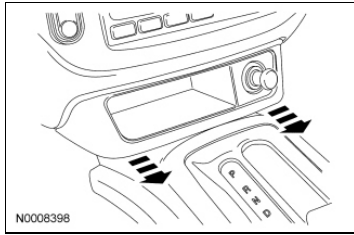


6. Position the ashtray bracket aside.
  1. Remove the 2 screws (not shown).
    - ♦ The screws can be accessed from under the instrument panel center stack.
  2. Slide the ashtray bracket forward, releasing the retainers and position the ashtray bracket out of the way to access the RCM .

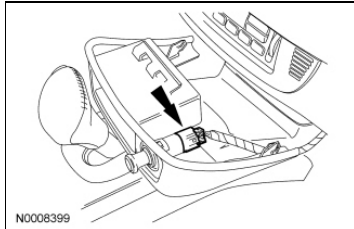


### Vehicles with floor shifter

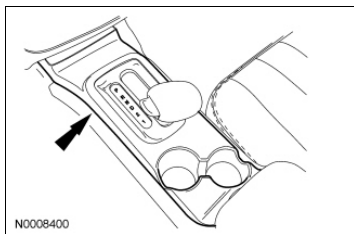
7. Release the retaining clips and detach the storage compartment.



8. Disconnect the power point electrical connector and remove the storage compartment.

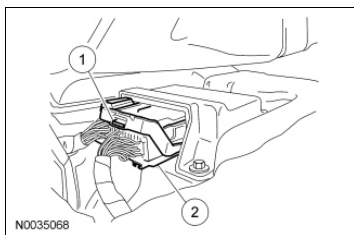


9. Detach the retaining clips and remove the floor console finish panel.



## All vehicles

10. Remove the 2 RCM bolts on the RH side.
11. Disconnect the large RCM electrical connector.
  1. Pinch the thumb tab and pivot the connector position assurance lever all the way back until it stops.
  2. Pull out and disconnect the RCM electrical connector.



12. Disconnect the small RCM electrical connector.
13. Remove the bolt on the LH side and RCM .

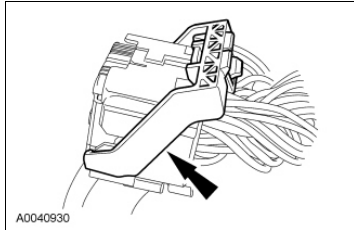
## Installation

### All vehicles

1. **⚠ WARNING:** Always tighten the fasteners of the restraints control module (RCM) and impact sensor (if equipped) to the specified torque. Failure to do so may result in incorrect restraint system operation, which increases the risk of personal injury or death in a crash.

Position the RCM and install the 2 RCM bolts on the RH side.

- Tighten to 12 Nm (106 lb-in).
2. Connect the small RCM electrical connector.
  3. Install the RCM bolt on the LH side.
    - Tighten to 12 Nm (106 lb-in).
  4. Make sure the connector position assurance lever is all the way back and in the full release position before attempting to connect the connector.



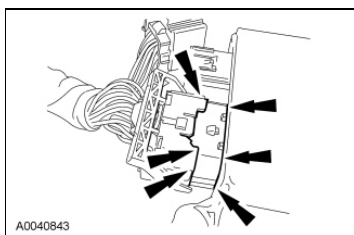
5. **NOTICE:** Placing the large Restraints Control Module (RCM) electrical wiring connector into the RCM on an angle may cause bad electrical connections and damaged components.

**NOTE:** The RCM has been removed for clarity.

Position the large RCM electrical connector into the RCM .

- **NOTICE:** Do not push the connector to the point where the lever pivots and seats itself. Light pressure is needed to get the connector into position on the Restraints Control Module (RCM), before using the lever to fully seat the connector. Damage to the connector or component may occur.

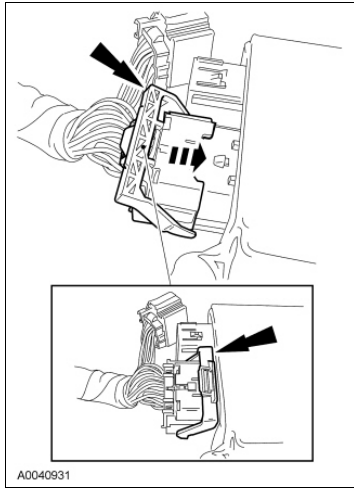
With the large RCM electrical connector uniformly aligned to the RCM , lightly push in until a subtle audible click is heard and slight resistance is felt.



6. **NOTE:** The RCM has been removed for clarity.

Connect the large RCM electrical connector.

- Using the connector position assurance lever, pivot it toward the RCM , drawing the connector into the RCM .
  - ♦ Make sure the thumb tab is engaged to the retainer on the RCM and is locked in place.



#### **Vehicles with column shifter**

7. Position the ashtray bracket, slide the retaining clips into place and install the 2 screws.
8. Install the ashtray.

#### **Vehicles with floor shifter**

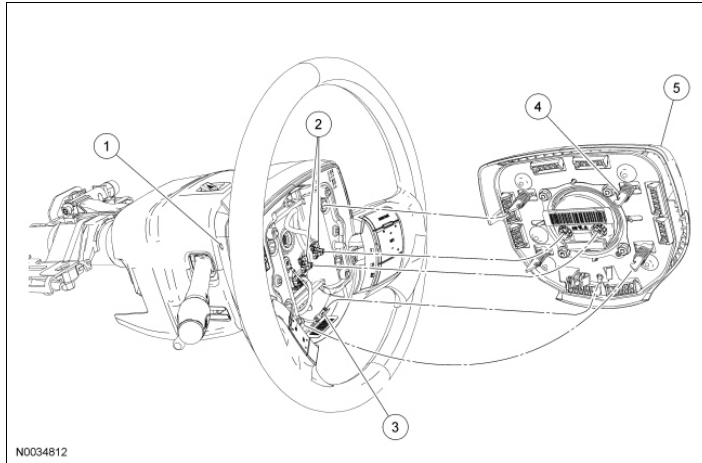
9. Connect the storage compartment power point electrical connector.
10. Align the retaining clips and install the storage compartment.
11. Align the retaining clips and install the floor console finish panel.
12. Place the transmission in PARK and release the parking brake.

#### **All vehicles**

13. Position the carpet patch and install the pin-type retainer.
  14. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
  15. If a new RCM was installed, carry out the appropriate steps necessary to complete PMI . For additional information, refer to Section 418-01 .
-





**Driver Air Bag Module**

Item	Part Number	Description
1	-	Steering wheel rear cover access hole (part of 3600) (4 required)
2	-	Driver air bag module electrical connectors (part of 14A664)
3	-	Horn electrical connector
4	-	Driver air bag module locking pin (part of 043B13) (4 required)
5	043B13	Driver air bag module

**Removal**

**⚠ WARNING:** Always carry or place a live air bag module with the air bag and deployment door/trim cover/tear seam pointed away from the body. Do not set a live air bag module down with the deployment door/trim cover/tear seam face down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** Do not paint any air bag module trim covers or deployment doors. Paint may cause the air bag to deploy incorrectly. Failure to follow this instruction may increase the risk of serious personal injury or death in a crash.

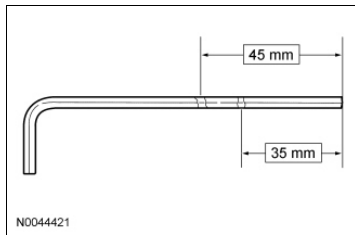
**NOTICE:** Make sure the steering wheel spring clips retaining the driver air bag module are disengaged from each of the 4 locking pins on the driver air bag module before removing the driver air bag module from the steering wheel. Failure to do so will damage the driver air bag module and steering wheel.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
2. **NOTE:** A tool that has a blunt end, such as a 4.0 mm (0.15 in) Allen wrench, is better able to disengage the steering wheel spring clip from the driver air bag module locking pins.

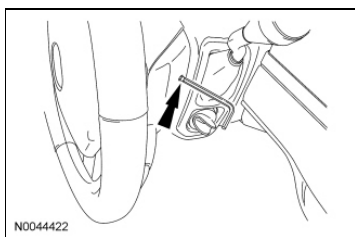
Using a 4 mm (0.15 in) Allen wrench or suitable tool, place 2 marks on the tool as an aid to remove the driver air bag module. One mark should be approximately 35 mm (1.37 in) from the end of the tool with the second mark approximately 45 mm (1.77 in) from the end of the tool.



3. **NOTE:** The steering wheel rear cover has internal guides that direct the tool to the spring clip. Allow the steering wheel rear cover to guide the tool, minimal force is needed.

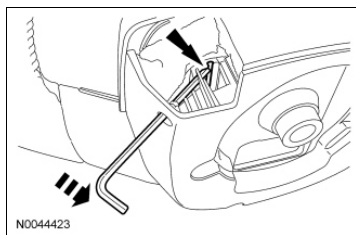
**Gently** insert the tool into a steering wheel rear cover upper access hole until the end of the tool comes into contact with an obstruction. The 45 mm (1.77 in) mark on the tool should be even or close to even with the steering wheel rear cover. If the 45 mm (1.77 in) mark on the tool is not even or close to even with the steering wheel rear cover, remove the tool from the steering wheel and carry out the step once again to correctly position the tool.

- If the 45 mm (1.77 in) mark on the tool goes into the steering wheel rear cover, the tool was directed past the steering wheel spring clip. Use a tool of a slightly larger diameter or, using the internal guides of the steering wheel rear cover, insert the tool to the 45 mm (1.77 in) mark and proceed to the next step.



4. **NOTE:** The steering wheel is removed for clarity. The upper corner of the steering wheel rear cover is cutaway to show the internal guides and the steering wheel spring clip.

With the tool correctly positioned, remove the tool approximately 2-3 mm (0.07-0.11 in) from the access hole then gently push the tool forward (toward front of vehicle). This puts the tool in the best position to disengage the steering wheel spring clip from the driver air bag module locking pin.

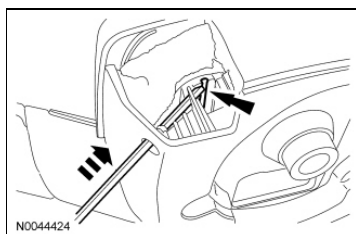


5. **NOTE:** Make sure to disengage the steering wheel spring clip from the driver air bag module locking pin before gently pulling the corresponding corner of the driver air bag module. No or very little force is needed to separate the corresponding corner of the driver air bag module from the steering wheel once the spring clip is disengaged from the locking pin.

**NOTE:** When the steering wheel spring clip is disengaged from the first locking pin, the corresponding corner of the driver air bag module will only separate 2-4 mm (0.07-0.15 in) from the steering wheel. The driver air bag module will separate more noticeably as subsequent locking pins are disengaged.

Push the tool deeper into the access hole (approximately 4-8 mm [0.15-0.31 in]) with enough force to disengage the steering wheel spring clip from the driver air bag module locking pin. The corresponding corner of the driver air bag module should pop up once the spring clip is disengaged from the locking pin. **Gently** pull the corresponding corner of the driver air bag module to make sure the locking pin does not re-engage the spring clip. Remove the tool from the access hole. Discontinue pulling on the corresponding corner of the driver air bag module.

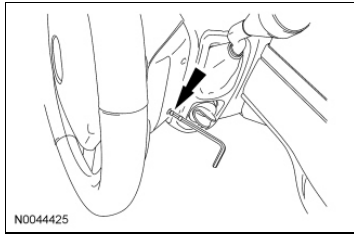
- If the corresponding corner of the driver air bag module does not easily separate from the steering wheel, the spring clip is not disengaged from the locking pin. Repeat the steps to position the tool correctly and disengage the spring clip from the locking pin.



6. **NOTE:** The steering wheel rear cover has internal guides that assist in directing the tool to the correct location. Allow the steering wheel rear cover to guide the tool, minimal force is needed.

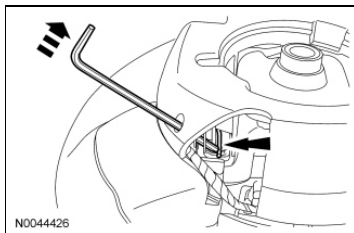
Working on the same side of the steering wheel, **gently** insert the tool into a steering wheel rear cover lower access hole until the end of the tool comes into contact with an obstruction. The 35 mm (1.37 in) mark on the tool should be even or close to even with the steering wheel cover. If the 35 mm (1.37 in) mark on the tool is not even or close to even with the steering wheel cover, remove the tool from the access hole and carry out the step again to position the tool correctly.

- If the 35 mm (1.37 in) mark on the tool goes into the steering wheel rear cover, the tool was inserted past the steering wheel spring clip. Use a tool of a slightly larger diameter or, using the internal guides of the steering wheel rear cover, insert the tool to the 35 mm (1.37 in) mark and proceed to the next step.



7. **NOTE:** The steering wheel is removed for clarity. The lower corner of the steering wheel rear cover is cutaway to show the internal guides and the steering wheel spring clip.

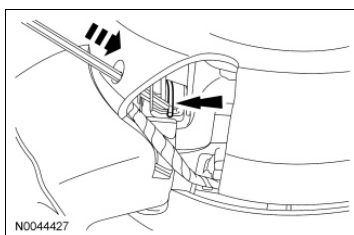
With the tool correctly positioned, remove it approximately 2-3 mm (0.07-0.11 in) out of the access hole then gently push the tool forward (toward front of vehicle). This puts the tool in the best position to disengage the steering wheel spring clip from the driver air bag module locking pin.



8. **NOTE:** Make sure to disengage the steering wheel spring clip from the driver air bag module locking pin before gently pulling the corresponding corner of the driver air bag module. No or very little force is needed to separate the corresponding corner of the driver air bag module from the steering wheel once the spring clip is disengaged from the locking pin.

Push the tool deeper into the access hole (approximately 3-6 mm [0.11-0.23 in]) with enough force to disengage the steering wheel spring clip from the driver air bag module locking pin. The corresponding corner of the driver air bag module should pop up once the spring clip is disengaged from the locking pin. **Gently** pull the corresponding corner of the driver air bag module to make sure the locking pin does not reengage the spring clip. Remove the tool from the access hole. Discontinue pulling on the corresponding corner of the driver air bag module.

- If the corresponding corner of the driver air bag module does not easily separate from the steering wheel the spring clip is not disengaged from the locking pin. Repeat the necessary steps to correctly position the tool and disengage the spring clip from the locking pin.



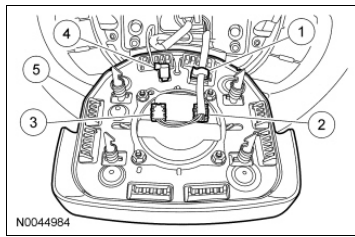
9. **NOTE:** Disengage the steering wheel spring clips from the 2 locking pins on one side of the driver air bag module before proceeding to the other side.

Repeat the above steps to disengage the 2 remaining driver air bag module locking pins.

10. Remove the driver air bag module.

1. Release the driver air bag module electrical wiring from the driver air bag wiring clip.
2. Squeeze the tabs and disconnect the driver air bag module electrical connector.
3. Squeeze the tabs and disconnect the driver air bag module electrical connector.

4. Disconnect the horn electrical connector.
5. Remove the driver air bag module.

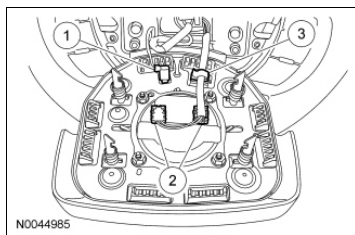


## Installation

1. Connect the driver air bag module.
  1. Connect the horn electrical connector.
  2. **NOTICE:** Match the electrical connector key to the keyway in the driver air bag module. Do not force the electrical connectors into the driver air bag module. Damage to the connector or component may occur.

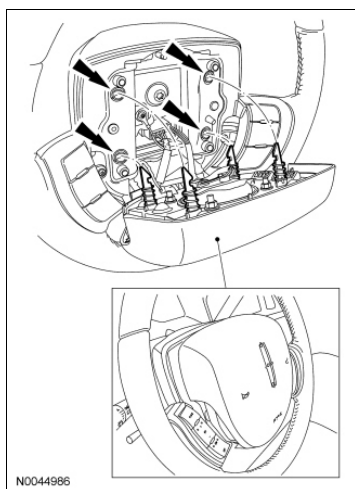
Connect the driver air bag module electrical connectors as noted during removal.

3. Install the driver air bag module electrical wiring into the driver air bag wiring clip.



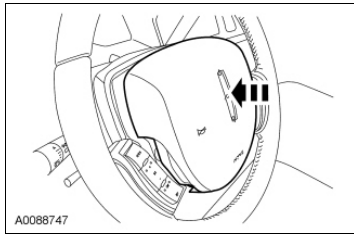
2. **NOTE:** With the driver air bag module held as close to the steering wheel as possible, take up the slack in the wiring by gently tucking any excess length into the pocket at the bottom of the steering wheel before rocking the driver air bag module into place.

Align the 4 driver air bag module locking pins to the openings in the steering wheel and position the driver air bag module in place.

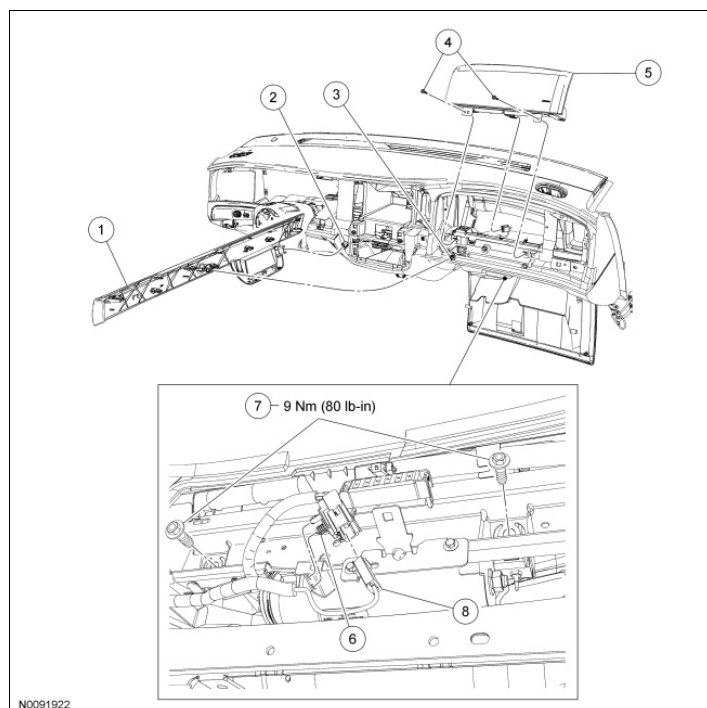


3. With the locking pins aligned and the driver air bag module positioned to the steering wheel, push inward seating the 4 locking pins to the spring clips.
  - An audible click should be heard when the driver air bag module locking pins are seated in place to the spring clip.

- When the 4 locking pins are seated in place, there should be an even uniform gap between the driver air bag module trim cover and the steering wheel.



4. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in this section.
-

**Passenger Air Bag Module**

Item	Part Number	Description
1	046A62	RH instrument panel trim panel
2	-	Rear window defrost switch electrical connector (part of 14401)
3	-	Passenger Air Bag Deactivation (PAD) indicator electrical connector (part of 14401)
4	N807122	Passenger air bag module deployment door bolts
5	044A74	Passenger air bag module
6	-	Passenger air bag module electrical connector pin-type retainer
7	W705314	Passenger air bag module bolts
8	-	Passenger air bag module electrical connector (part of 14401)

**Removal and Installation**

**⚠ WARNING:** Always carry or place a live air bag module with the air bag and deployment door/trim cover/tear seam pointed away from the body. Do not set a live air bag module down with the deployment door/trim cover/tear seam face down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.



**⚠ WARNING: Do not paint any air bag module trim covers or deployment doors. Paint may cause the air bag to deploy incorrectly. Failure to follow this instruction may increase the risk of serious personal injury or death in a crash.**

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
  2. Remove the RH instrument panel trim panel.
    - Pull out to release the retaining clips.
    - Slide the RH instrument panel trim panel slightly to the right, aligning the keyway.
    - Disconnect the rear window defrost switch electrical connector.
    - If equipped, disconnect the clock electrical connector.
    - Disconnect the Passenger Air Bag Deactivation (PAD) indicator.
    - Remove the trim panel.
  3. Disconnect the passenger air bag module electrical connector.
    - Through the glove compartment opening, separate the passenger air bag module electrical connector and pin-type retainer from the bracket.
    - Disconnect the electrical connector.
  4. Remove the 2 passenger air bag module bolts.
    - To install, tighten to 9 Nm (80 lb-in).
  5. **NOTICE: Do not handle the passenger air bag module by the edges of the deployment doors. Damage to the air bag module may occur.**

Remove the 2 passenger air bag module deployment door bolts and passenger air bag module.
  6. To install, reverse the removal procedure.
  7. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
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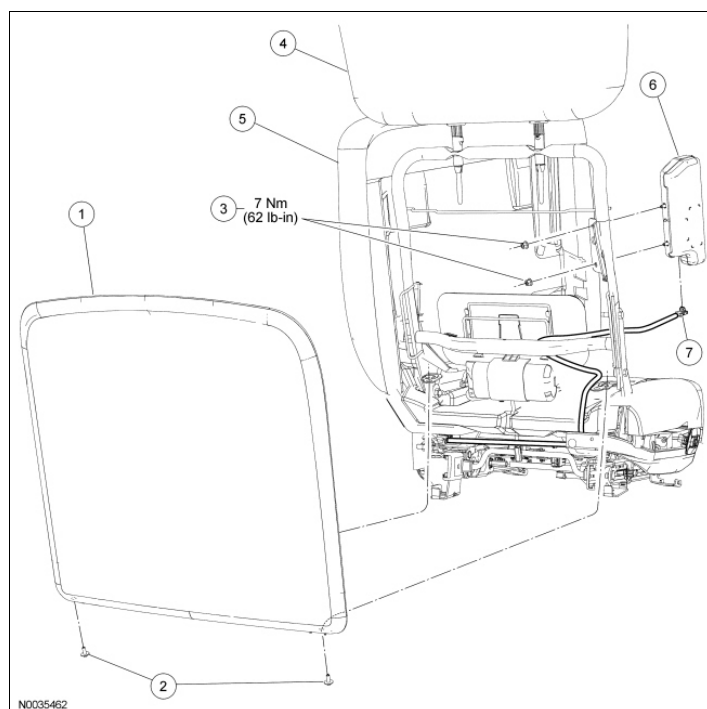


SECTION 501-20B: Supplemental Restraint  
System  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

## Side Air Bag Module

**NOTE:** RH shown, LH similar.



Item	Part Number	Description
1	60770	Seat back trim panel (police only)
2	-	Seat back trim panel screws (police vehicles only) (2 required)
3	N620480	Side air bag module nuts
4	64416	Seat backrest cover
5	64810	Seat backrest foam pad
6	611D10	Side air bag module
7	-	Side air bag module electrical connector (part of 14716)

### Removal

**⚠ WARNING:** Always carry or place a live air bag module with the air bag and deployment door/trim cover/tear seam pointed away from the body. Do not set a live air bag module down with the deployment door/trim cover/tear seam face down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**⚠ WARNING:** If the seat side air bag cover has been damaged or separated from its mounting, or if the air bag material has been exposed, install a new seat side air bag module. Never try to repair the

**seat side air bag module. Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.**

**⚠ WARNING:** Front seat backrest trim covers installed on seats equipped with seat side air bags cannot be repaired. A new trim cover must be installed. Cleaning is permissible. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.

**NOTE:** If a side air bag deployment took place, the backrest foam pad, cover and side air bag module must be installed new. The seatback frame should be installed new if necessary.

**NOTE:** When installing a new side air bag after deployment, refer to Section 501-10 for additional information concerning the installation of a new side air bag.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

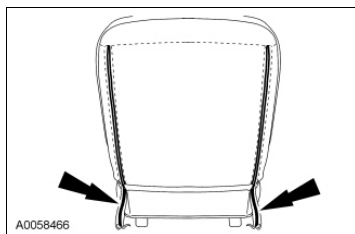
**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

### All vehicles

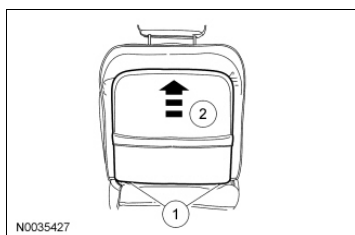
1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

### Police vehicles

2. Remove the zippers from under the material, unzip both the zippers and position the seat backrest cover up to access the seat back trim panel.



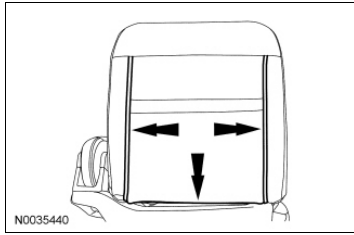
3. Remove the seat back trim panel.
  1. Remove the 2 screws located at the bottom of the seat back trim panel.
  2. Pull out at the bottom and slide the seat back trim panel up to disengage the 2 upper retaining hooks.



### Non-police vehicles

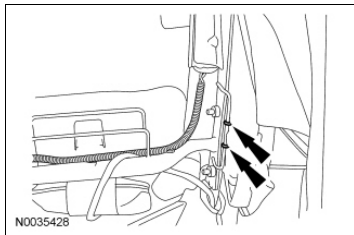
4. Release the 3 seat back cover J-clips.
  - Release the lower J-clip.

- Release the 2 side J-clips.



### All vehicles

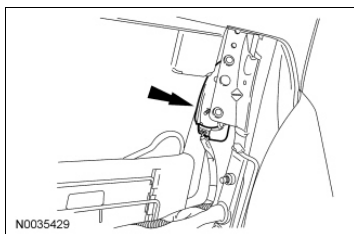
5. Remove the outboard hog rings that attach the foam pad to the seat backrest frame.



6. **NOTE:** If installing a new side air bag module, use new retaining nuts. If the same side air bag module is to be reused, reuse the side air bag module nuts.

Remove the 2 side air bag module nuts.

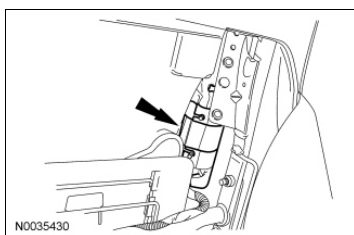
7. Position the side air bag module and deployment chute away from the mounting bracket and seat back frame.



8. Position the seat back cover and seat back pad forward enough to access the side air bag module.

9. Remove the side air bag module from the deployment chute.

- Pull the side air bag module mounting studs back through the deployment chute openings and remove the side air bag module from the deployment chute.



10. Disconnect the electrical connector and remove the side air bag module.

### Installation

**All vehicles**

1. Connect the side air bag module electrical connector.
2. **⚠ WARNING: Before installing the seat side air bag module/deployment chute assembly:**
  - ◆ Inspect the side air bag module and mounting surfaces for any damage or foreign material.
  - ◆ Remove any foreign material from the mounting surfaces of the deployment chute, the seat backrest frame mounting bracket and the air bag module cavity in the seat backrest foam pad.
  - ◆ Install new parts if damaged.

Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

**⚠ WARNING: Inspect the seat side air bag module and mounting surfaces for any damage or foreign material before installing the seat side air bag module. If any damage is found, install new components. If any foreign material is found, remove it. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.**

**⚠ WARNING: If the seat side air bag cover has been damaged or separated from its mounting, or if the air bag material has been exposed, install a new seat side air bag module. Never try to repair the seat side air bag module. Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.**

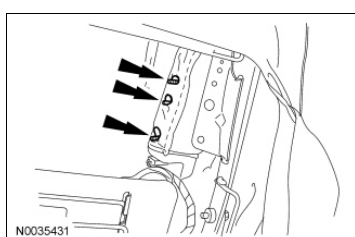
**⚠ WARNING: Check the seat side air bag deployment chute for damage. The deployment chute must not be repaired. If there is any damage to the deployment chute, a new seat back trim cover and deployment chute must be installed as a unit. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.**

**⚠ WARNING: If the seat side air bag module deployment chute is not correctly positioned and closed, the seat side air bag module may not deploy correctly. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increases the risk of serious personal injury or death in a crash.**

**NOTE:** The alignment pin will only allow the side air bag module to be installed to the seat back mounting bracket one way.

Position the side air bag module into the deployment chute.

- Position the side air bag module into the deployment chute with the alignment pin offset to the top and the electrical connector to the bottom of the seat back. This will position the alignment pin correctly when the side air bag module and deployment chute are mounted to the seat back frame mounting bracket.
- The side air bag module mounting studs and alignment pin must come through the deployment chute stud openings.



3. **⚠ WARNING: Before installing the seat side air bag module/deployment chute assembly:**

- ◆ Inspect the side air bag module and mounting surfaces for any damage or foreign material.
- ◆ Remove any foreign material from the mounting surfaces of the deployment chute, the seat backrest frame mounting bracket and the air bag module cavity in the seat backrest foam pad.
- ◆ Install new parts if damaged.

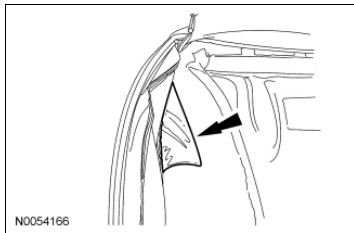
Failure to follow these instructions may result in the seat side air bag deploying incorrectly, which increases the risk of serious personal injury or death in a crash.

**⚠ WARNING: Front seat backrest trim covers installed on seats equipped with seat side air bags cannot be repaired. A new trim cover must be installed. Cleaning is permissible. Failure to follow these instructions may result in the seat side air bag module deploying incorrectly and increase the risk of serious personal injury or death in a crash.**

Install the side air bag module onto the front seat back frame mounting bracket and 2 nuts.

- The deployment chute should not have any wrinkles or folds where it contacts the seat back frame mounting bracket.
- Tighten to 7 Nm (62 lb-in).

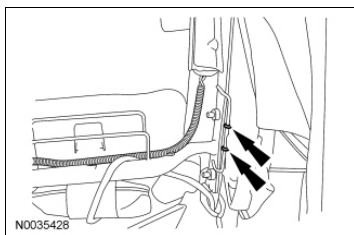
4. Make sure the seat backrest cover deflector flap is positioned with no wrinkles or folds between the cover and seat back pad.



5. Reposition the seat back pad and cover to the seat back frame.

6. Install the outboard hog rings that attach the foam pad to the seat backrest frame.

- Make sure the hog rings go around the listing wire in the foam pad as well as the backrest frame wire.

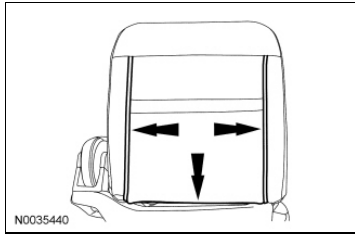


**Non-police vehicles**

7. **NOTE:** Note the alignment of the 2 side J-clips at the top of the seat to avoid bunching.

Attach the 3 seat back cover J-clips.

- Attach the 2 side J-clips.
- Attach the lower J-clip.

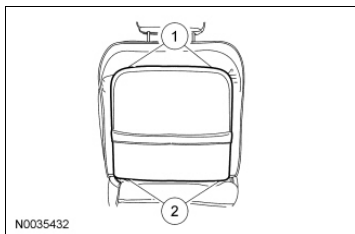


### Police vehicles

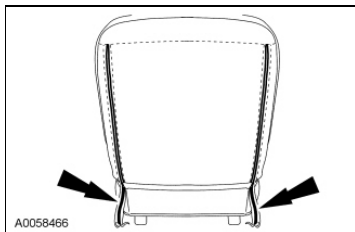
8. **NOTICE:** Inspect the seat back trim panel retaining hooks for damage. If damaged, install a new seat back trim panel.

Install the seat back trim panel.

1. Angle the top of the seat back trim panel inward and down to engage the 2 upper retaining hooks to the seat back frame.
2. Push in on the lower seat back trim panel and install the 2 screws.



9. Pull the seat backrest material down, zip both the zippers and tuck the zippers under the material.

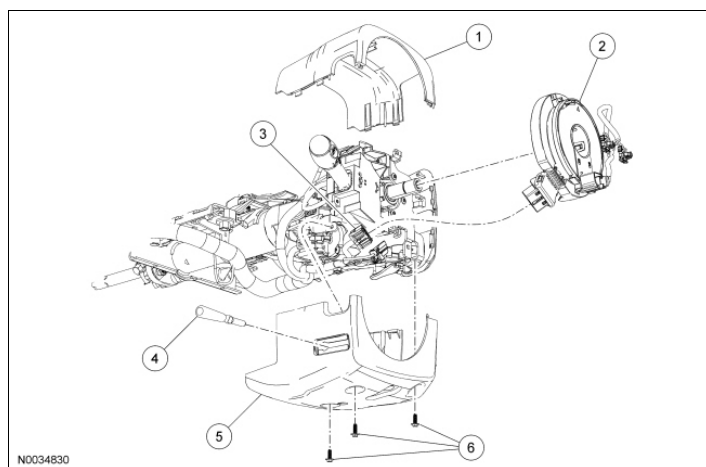


### All vehicles

10. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
-





**Clockspring**

Item	Part Number	Description
1	3530	Upper steering column shroud
2	14A664	Clockspring
3	-	Clockspring electrical connector (part of 14401)
4	3F609	Tilt column lever
5	3530	Lower steering column shroud
6	W710485	Lower steering column shroud screws

**Removal**

**⚠ WARNING:** Always carry or place a live air bag module with the air bag and deployment door/trim cover/tear seam pointed away from the body. Do not set a live air bag module down with the deployment door/trim cover/tear seam face down. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.

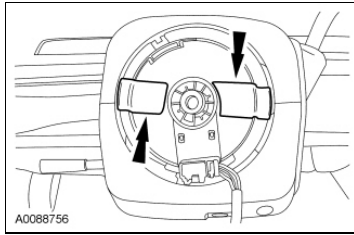
**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

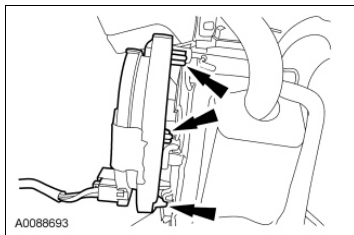
1. Remove the driver air bag module. For additional information, refer to [Driver Air Bag Module](#) in this section.
2. **NOTICE:** Make sure the road wheels are in the straight-ahead position. Failure to follow this instruction may cause damage to the clockspring.

Remove the steering wheel. For additional information, refer to [Section 211-04](#).

3. Apply 2 strips of masking tape across the clockspring to prevent accidental rotation when the clockspring is removed.



4. Position the tilt steering column all the way up to allow for upper and lower steering column shroud removal.
5. Remove the tilt column lever.
6. Remove the 3 lower steering column shroud screws.
7. Release the retainers to the upper steering column shroud and remove the lower steering column shroud.
8. Remove the upper steering column shroud.
9. Disconnect the clockspring electrical connector.
10. Release the 3 retaining clips and remove the clockspring.



## Installation

### Vehicles receiving a new clockspring

1. **NOTE:** A new clockspring is supplied in a centralized position and held in position with a key.

Remove the key from the clockspring, holding the rotor in its centralized position.

- Do not allow the clockspring rotor to move.

### Vehicles needing clockspring recentering

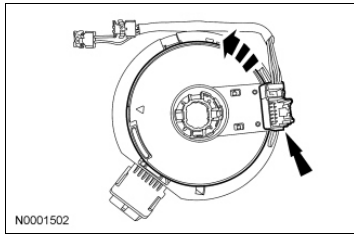
**⚠ WARNING:** If the clockspring is not correctly centralized, it may fail prematurely. If in doubt, repeat the centralizing procedure. Failure to follow these instructions may increase the risk of serious personal injury or death in a crash.

**NOTE:** If a clockspring has rotated out of center, carry out the following steps.

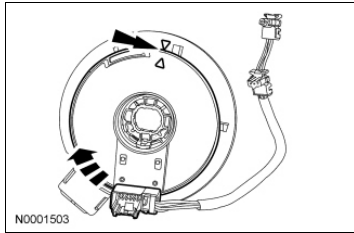
2. **NOTICE:** Overturning will destroy the clockspring. The internal ribbon wire acts as the stop and may be broken from its internal connection.

Rotate the rotor counterclockwise until it stops.

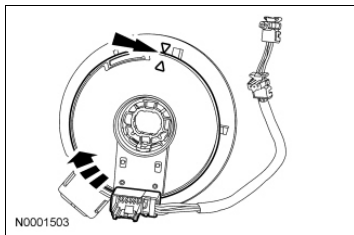
- While rotating the rotor counterclockwise, carefully feel for the ribbon wire to run out of length. Stop when a slight resistance is felt.



3. Rotate the rotor clockwise and stop when the arrows line up.



4. Rotate the rotor clockwise 2 complete turns and line up the arrows. Stop rotating at this point. This is the center point of the clockspring.
  - Do not allow the rotor to move from this position.



### Vehicle repairs reusing the same clockspring

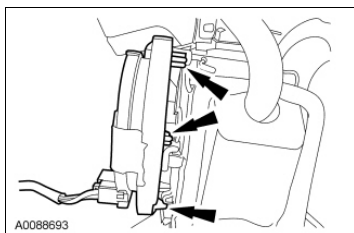
5. **NOTE:** When the tape is removed, do not allow the rotor to move.

Remove the tape applied during clockspring removal.

### All vehicles

6. **NOTE:** Slight rotor rotation is allowable for alignment purposes to the steering column.

With the flats of the clockspring aligned to the flats of the steering column, slide the clockspring onto the steering column engaging the retaining tabs.




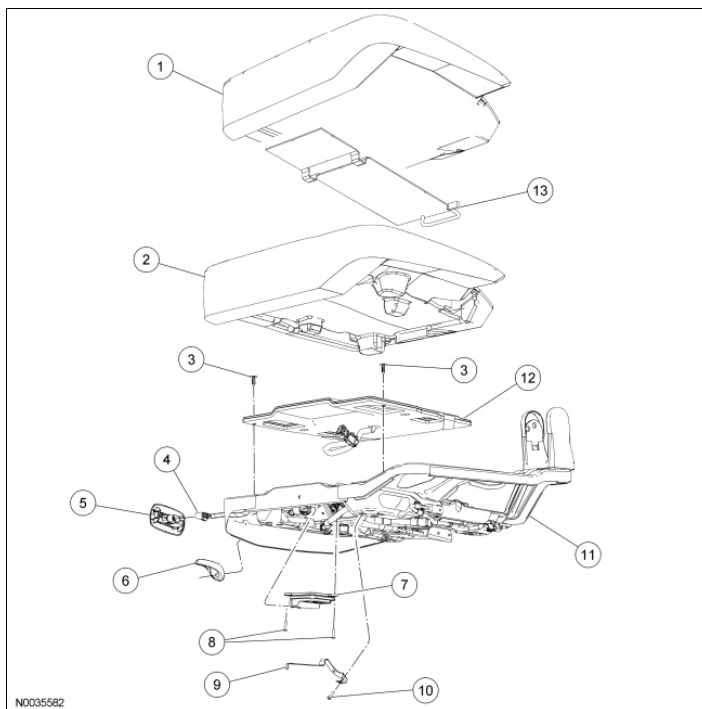
7. Connect the clockspring electrical connector.

8. Position the upper steering column shroud.
    - If equipped, engage the column shift lever boot to the upper steering column shroud.
  9. Position and engage the lower steering column shroud to the column shift lever boot and upper steering column shroud and install the 3 screws.
  10. Install the tilt column lever.
  11. Install the steering wheel. For additional information, refer to Section 211-04 .
  12. Install the driver air bag module. For additional information, refer to Driver Air Bag Module in this section.
-

**Occupant Classification Sensor**

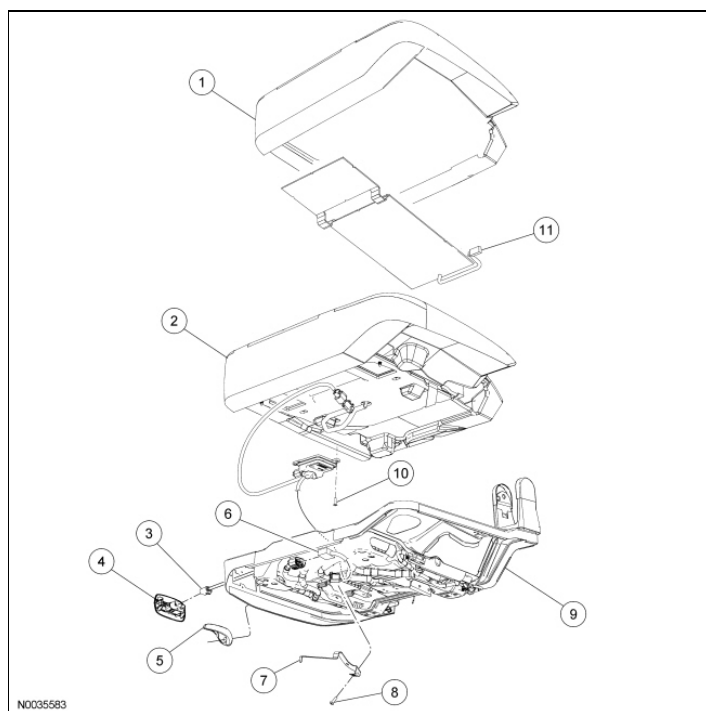
## Special Tool(s)

 ST2834-A	<b>Vehicle Communication Module (VCM)</b> <b>and Integrated Diagnostic System (IDS)</b> software with appropriate hardware, or equivalent scan tool
---	--

**Seat with OEM Occupant Classification System (OCS)**

Item	Part Number	Description
1	62900	Seat cushion cover
2	-	Seat cushion pad
3	-	Pin-type retainers
4	-	Power lumbar switch electrical connector (part of 14A699)
5	14A706	Power lumbar switch and bezel
6	61198	Seat backrest recliner handle
7	-	Occupant Classification System Module (OCSM)
8	-	OCSM rivets
9	-	OCSM bracket

10	-	OCSM bracket rivet
11	63100	Seat cushion frame
12	-	Occupant Classification System (OCS) (bladder and hose with pressure sensor)
13	-	Heater mat electrical connector

**Seat with a Service Kit Occupant Classification System (OCS)**

Item	Part Number	Description
1	62900	Seat cushion cover
2	632A22	Occupant Classification System (OCS) system service kit (foam pad, bladder, hose with pressure sensor, Occupant Classification System Module (OCSM) and wiring harness)
3	-	Power lumbar switch electrical connector (part of 14A699)
4	14A706	Power lumbar switch and bezel
5	61198	Seat backrest recliner handle
6	-	OCS service kit electrical connector (part of service kit 632A22)
7	-	OCSM bracket
8	-	OCSM bracket rivet
9	63100	Seat cushion frame
10	-	OCSM rivet (2 required)
11	-	Heater mat electrical connector (if equipped, part of 14D698)

**Removal****Seat with OEM Occupant Classification System (OCS)**

**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners, adaptive load limiting retractors, safety belt inflators, or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners, adaptive load limiting retractors, or safety belt inflators, which increases the risk of serious personal injury or death.

**NOTE:** To identify between a production Occupant Classification System (OCS) system and an OCS system service kit, inspect the Occupant Classification System Module (OCSM) electrical connector. A production OCS system allows the disconnect of the OCSM electrical connector. An OCS system service kit has the OCSM electrical connector glued to the module. It cannot and should not be disconnected or altered.

**NOTE:** The heater mat on the front passenger seat cushion is not serviceable separately. If a new heater mat is needed on the front passenger seat cushion, a new OCS system service kit and a new heater mat must be installed.

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

#### All seats

1. Remove the front passenger seat. For additional information, refer to [Section 501-10](#).
2. Remove the front seat backrest. For additional information, refer to [Section 501-10](#).
3. Remove the seat track. For additional information, refer to [Section 501-10](#).

#### Heated seats

4. Disconnect the seat cushion heater mat electrical connector.

#### Seats with manual recline

5. Remove the seat backrest recliner handle.

#### Seats with power lumbar

6. Release the tabs at the front and back to separate the power lumbar switch and bezel from the seat cushion frame.
7. Disconnect the electrical connector and remove the power lumbar switch.

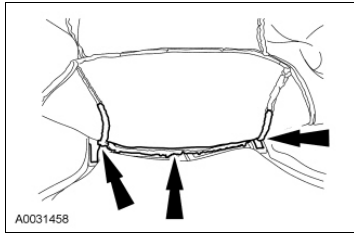
#### All seats

8. Release the remaining seat cushion cover J-clips.
9. **NOTICE:** It is necessary to carry out the Occupant Classification System (OCS) system reset when a front passenger seat cushion is disassembled, a new seat cushion cover installed or an OCS service kit is installed. A scan tool is used to carry out the OCS system reset.

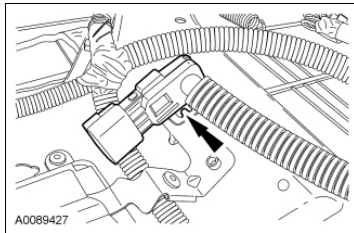
**NOTICE:** Use care when separating the seat cushion cover from the hook-and-loop strip. The hook-and-loop strip can be torn from the seat cushion foam. Failure to follow this procedure can result in component damage and/or system failure.



Separate the hook-and-loop strips. Position the seat cushion cover aside.



10. Bend the retaining tab holding the pressure sensor in place down and aside.



### Seats with an original equipment Occupant Classification System (OCS) system

11. Remove the seat cushion pad from the seat cushion frame.

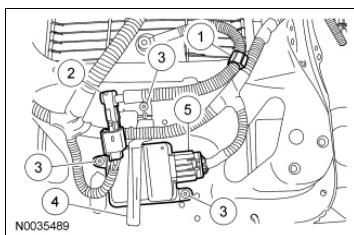
12. If necessary, remove the 2 pin-type retainers and the mat, otherwise position the mat aside.

13. Remove the OCSM and separate the pressure sensor from the OCSM bracket.

1. Release the pressure sensor hose.
2. Disconnect the electrical connector and slide the pressure sensor off the bracket.
3. **NOTICE: Do not oversize the seat cushion frame holes used to rivet the Occupant Classification System Module (OCSM) in place. Failure to follow these instructions may result in incorrect operation of the Occupant Classification System (OCS) system and may cause system failure.**

Using a 5 mm (3/16 in) drill, remove the 3 rivets.

4. Remove the OCSM bracket.
5. Disconnect and remove the OCSM .

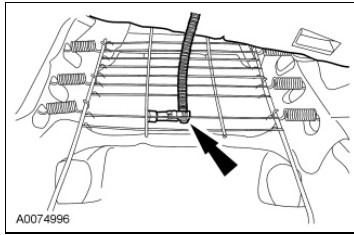


14. Remove the pin-type retainers holding the occupant classification sensor bladder to the seat cushion frame.

15. **NOTE:** Make note of the opening that the pressure sensor and hose are being fed through on the seat cushion support assembly for installation purposes.

Separate the OCS bladder and pressure sensor from the seat cushion frame.

- Feed the pressure sensor and hose through the seat cushion support assembly.



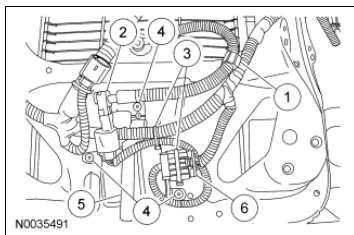
### Seats with an OCS system service kit

16. Separate the OCS system components from the seat cushion frame.

1. Release the pressure sensor hose.
2. Slide the pressure sensor off the bracket.
3. Cut the tie-straps.
4. **NOTICE:** Do not oversize the seat cushion frame holes used to rivet the Occupant Classification System Module (OCSM) in place. Failure to follow these instructions may result in incorrect operation of the Occupant Classification System (OCS) system and may cause system failure.

Using a 5 mm (3/16 in) drill, remove the 3 rivets.

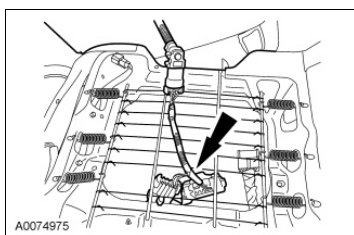
5. Remove the OCSM bracket.
6. Disconnect the service part OCS electrical connector.



17. **NOTE:** Make note of the opening that the OCS system components are being fed through on the seat cushion support assembly for installation purposes.

Remove the OCS system from the seat cushion frame.

- Feed the hose, pressure sensor, wire harness, electrical connector and OCSM through the seat cushion frame support assembly.



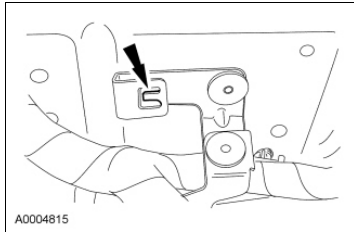
18. If necessary, remove the 2 pin-type retainers and the cushion mat. Otherwise, position the mat aside.

### Installation

**⚠ WARNING:** Occupant Classification System (OCS) parts are calibrated as an assembly and must only be replaced in the configuration they are sold. Never separate parts of an assembly. Failure to follow this instruction may result in incorrect operation of the OCS and increases the risk of serious personal injury or death in a crash.

## All seats

1. Bend the pressure sensor bracket retaining ear back so it will engage upon assembly.



## Vehicles with heated seats

2. **NOTE:** The heater mat on the front passenger seat cushion is not serviceable separately. If a new heater mat is needed on the front passenger seat cushion, a new OCS system service kit and a new heater mat must be installed.

Attach the heater mat to the seat cushion pad.

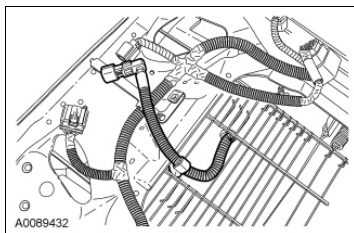
## Seats having the original equipment OCS system installed

3. **NOTICE:** Failure to route the seat Occupant Classification System (OCS) system components through the correct seat cushion support opening can cause system failure and incorrect OCS system operation.

**NOTICE:** Inspect the Occupant Classification System (OCS) system assembly, seat cushion frame and support assembly for any foreign objects before installing the OCS system assembly to the seat cushion frame. If any foreign objects are found, remove them. Failure to follow this instruction may result in system failure and the incorrect operation of the OCS system.

Position the OCS system assembly to the seat cushion frame.

- Feed the pressure sensor with hose through the largest opening at the front of the seat cushion frame support assembly as noted during removal.

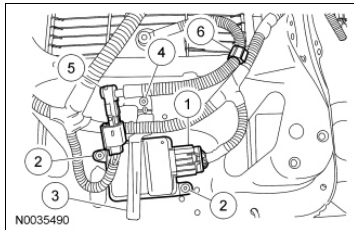


4. **NOTICE:** Inspect the Occupant Classification System (OCS) bladder, seat cushion frame and support assembly for any foreign objects, before installing the OCS system to the seat cushion frame. If any foreign objects are found, remove them. Failure to follow this instruction may result in system failure and the incorrect operation of the OCS system.

Install the pin-type retainers holding the OCS bladder to the seat cushion frame.

5. If the cushion mat was removed, position the mat over the bladder and install pin-type retainers, otherwise position the mat over the bladder.
6. Attach and connect the OCS system components.

1. Position the OCSM to the seat cushion frame and connect the electrical connector.
2. Install the 2 rivets to hold the OCSM in place.
3. Position the OCSM bracket through the opening in the front of the seat cushion frame.
4. Install the OCSM bracket rivet.
5. Install the pressure sensor onto the seat cushion frame bracket, making sure the retaining ear is completely engaged.
  - ◆ Connect the pressure sensor electrical connector.
6. Attach the pressure sensor hose.



7. **NOTICE:** Inspect the seat cushion pad and frame for any foreign objects before installing the seat cushion frame to the seat cushion pad. If any foreign objects are found, remove them. Failure to follow this instruction may result in system failure and the incorrect operation of the Occupant Classification System (OCS) system.

Install the seat cushion pad to the seat cushion frame.

#### Seats having an OCS system service kit installed

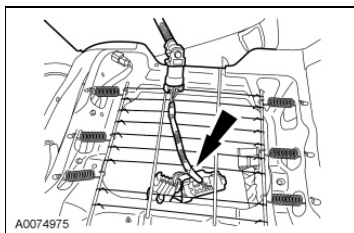
8. **NOTICE:** Inspect the Occupant Classification System (OCS) system assembly, seat cushion frame and support assembly for any foreign objects, before installing the OCS system assembly to the seat cushion frame. If any foreign objects are found, remove them. Failure to follow this instruction may result in system failure and the incorrect operation of the OCS system.

**NOTICE:** Failure to route the seat Occupant Classification System (OCS) system components through the correct seat cushion support opening can cause component failure.

**NOTE:** If the original equipment OCS system is not being installed, install a OCS system service kit using all parts in the kit.

Position the OCS assembly to the seat cushion frame.

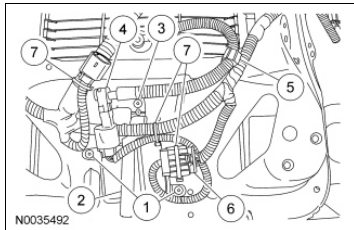
- Using an OCS system service kit, feed the OCSM , electrical connector, wire harness, pressure sensor and hose through the largest opening at the front of the seat cushion frame support assembly as noted during removal.
  - ◆ Position the seat cushion pad and bladder to the seat cushion frame.



9. **NOTE:** When installing a OCS system service kit, the main seat wire harness pressure sensor electrical connector does not get used.

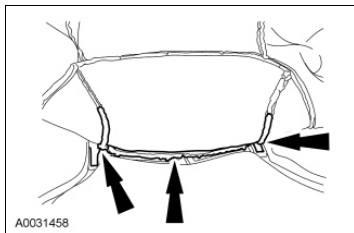
Attach and connect the OCS system components.

1. Position the OCSM onto the seat cushion frame and install the 2 rivets.
2. Position the OCSM bracket through the opening in the front of the seat cushion frame.
3. Install the OCSM bracket rivet.
4. Install the pressure sensor onto the seat cushion frame bracket, making sure the retaining ear is completely engaged.
5. Attach the pressure sensor hose.
6. Connect the main seat wire harness OCSM electrical connector to the OCSM service part electrical connector.
7. Tie-strap all loose wire harnesses and electrical connectors safely aside.



### All seats

10. Align the seat cushion cover to the seat cushion pad and fasten the hook-and-loop strips.



11. Position the seat cushion cover and attach the J-clips.

### Seats with power lumbar

12. Connect the power lumbar switch electrical connector.
13. Attach the power lumbar switch and bezel to the seat.

### Seats with manual recline

14. Install the seat backrest recliner handle.

### Heated seats

15. Connect the seat cushion heater mat electrical connector.

### All seats

16. Install the seat track. For additional information, refer to [Section 501-10](#).
17. Install the front seat backrest. For additional information, refer to [Section 501-10](#).
18. Install the front passenger seat. For additional information, refer to [Section 501-10](#).

19. **⚠ WARNING:** Make sure the front passenger seat repair is complete, the seat and all attached components (head restraint, seat side shield, etc.) are correctly assembled, and the seat is correctly installed to the vehicle before carrying out the System Reset. Failure to follow these instructions may result in incorrect operation of the occupant classification system (OCS) and increases the risk of serious personal injury or death in a crash.

**NOTICE:** To prevent system failure, the following precautions must be taken before carrying out the Occupant Classification System (OCS) system reset:

- ◆ Make sure the voltage to the Occupant Classification System Module (OCSM) is above 8 volts and less than 18 volts.
- ◆ Make sure the OCS system is not at a temperature below 6°C (42°F) or above 36°C (97°F) when initiating the OCS system reset process. If the vehicle has been exposed to extreme cold or hot temperatures, the vehicle must be exposed and kept at a temperature within the limits, 6°C to 36°C (42°F to 97°F) for a minimum of 30 minutes.
- ◆ Make sure nothing is present on the passenger seat before carrying out the OCS system reset and nothing is placed on the seat during the process.
- ◆ Make sure a minimum 8-second time period has passed after cycling the ignition ON before the carrying out the OCS system reset.

Carry out the Occupant Classification System (OCS) System Reset.

20. If the first system reset attempt was unsuccessful, carry out a thorough visual inspection of the following and repair any concerns found.
- OCS system connector wiring for damage
  - Pressure sensor hose for kinks and/or damage
  - Seat-related wiring harness and body wiring harness terminals and connectors for damage
21. Carry out a second OCS system reset. If the second attempt is unsuccessful, install a new OCS system service kit. For additional information, refer to Occupant Classification Sensor in the Removal and Installation portion of Section 501-20B.
22. Cycle the ignition switch from ON to OFF.
23. **NOTE:** The ignition switch must be cycled after the OCS system reset.

Cycle the ignition switch from OFF to ON.

24. Prove out the SRS as follows:
- Turn the ignition from ON to OFF. Wait 10 seconds, then turn the ignition back to ON and monitor the air bag warning indicator with the air bag modules installed. The air bag warning indicator will light continuously for approximately 6 seconds and then turn off. If an air bag SRS fault is present, the air bag warning indicator will:
- fail to light.
  - remain lit continuously.
  - flash.
- The flashing might not occur until approximately 30 seconds after the ignition has been turned from the OFF to the ON position. This is the time required for the RCM to complete the testing of the SRS. If the air bag warning indicator is inoperative and a SRS fault exists, a chime will sound in a pattern of 5 sets of 5 beeps. If this occurs, the air bag warning indicator and any SRS faults discovered must be diagnosed and repaired.
- Clear all continuous DTCs from the RCM using a scan tool.

25. **NOTE:** When installing a new OCS system service kit, a prepaid return postcard is provided with the new OCS. The serial number for the new part and the Vehicle Identification Number (VIN) must be

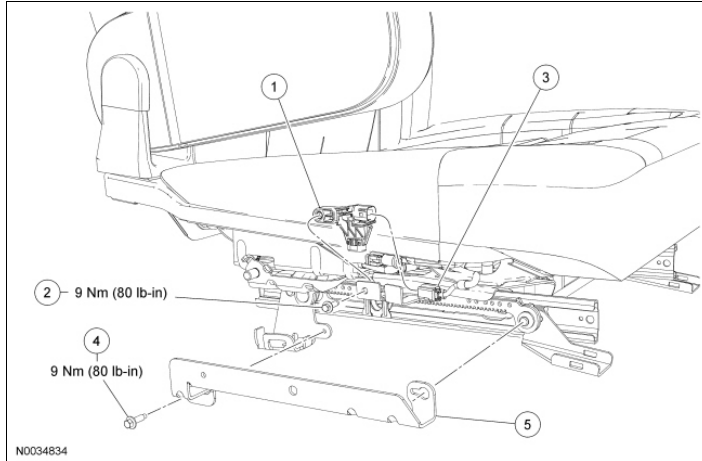


SECTION 501-20B: Supplemental Restraint  
System  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

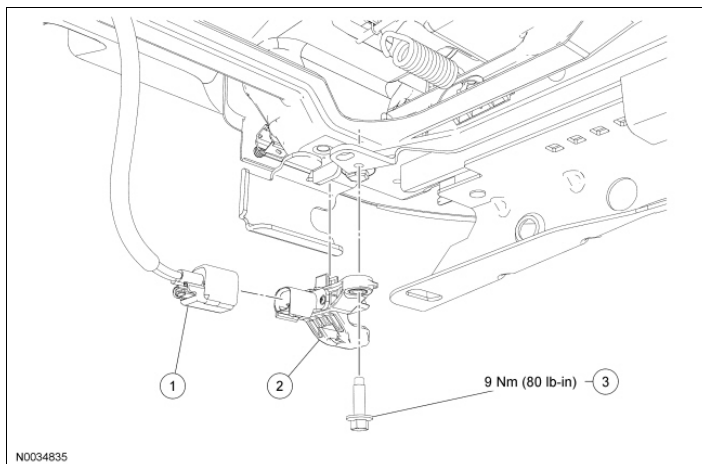
## Seat Position Sensor

### Vehicles with Power Seats



Item	Part Number	Description
1	14B416	Seat position sensor
2	W611624	Seat position sensor bolt
3	-	Seat position sensor electrical connector (part of 14A669)
4	W611624	Magnet assembly bolt
5	14B417	Magnet assembly

### Vehicles with Manual Seats



Item	Part Number	Description
1	-	Seat position sensor electrical connector (part of 14A669)
2	14B416	Seat position sensor



3	W611624	Seat position sensor bolt
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**Removal and Installation**

**NOTE:** The air bag warning indicator illuminates when the correct Restraints Control Module (RCM) fuse is removed and the ignition is ON.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**All vehicles**

1. Depower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.

**Vehicles with power seats**

2. Disconnect the seat position sensor electrical connector.
3. Remove the seat position sensor bolt.
  - To install, tighten to 9 Nm (80 lb-in).
4. Remove the seat position sensor.
  - Press the sensor tab inward to release and remove the seat position sensor.
5. Remove the magnet assembly bolt.
  - To install, tighten to 9 Nm (80 lb-in).
6. Remove the magnet assembly.
  - Slide the magnet assembly rearward to release the front tab to remove the magnet assembly.

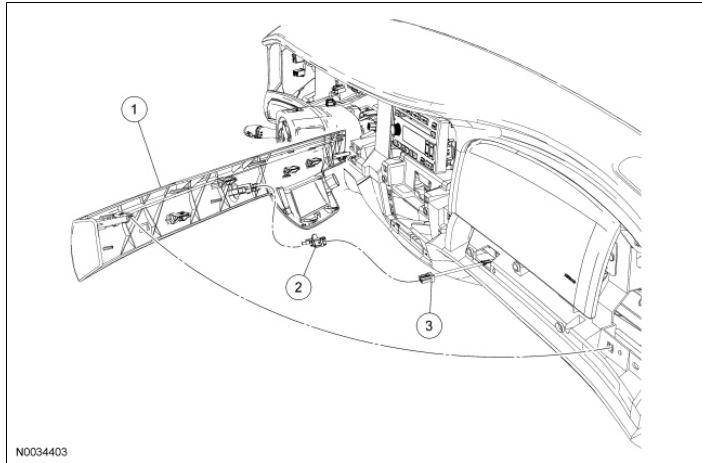
**Vehicles with manual seats**

7. Disconnect the seat position sensor electrical connector.
8. Remove the bolt and the seat position sensor.
  - To install, tighten to 9 Nm (80 lb-in).

**All vehicles**

9. To install, reverse the removal procedure.
  10. Repower the SRS . For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of this section.
-



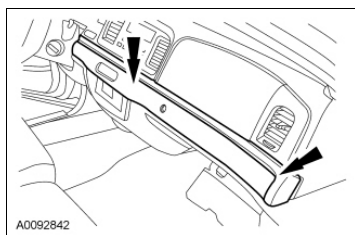
**Passenger Air Bag Deactivation (PAD) Indicator**

Item	Part Number	Description
1	046A62	RH instrument panel trim panel
2	10A936	Passenger Air Bag Deactivation (PAD) indicator
3	-	PAD indicator electrical connector (part of 14401)

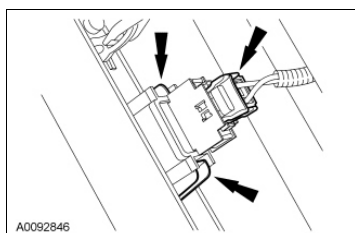
1. **NOTE:** Ignition must be OFF if disconnecting the Passenger Air Bag Deactivation (PAD) indicator electrical connector. Otherwise, a DTC will be set in the Restraints Control Module (RCM) memory and must be cleared before releasing the vehicle.

Turn the ignition OFF and wait at least one minute.

2. Separate the RH instrument panel trim panel.
  - Pull out to release the retaining clips.
  - Slide the RH instrument panel trim panel slightly to the right, aligning the keyway.
  - Pull out, separating the RH instrument panel trim panel.



3. Disconnect the electrical connector, release the retainers and remove the PAD indicator.



4. To install, reverse the removal procedure.
-

## Material

Item	Specification	Fill Capacity
Clear Silicone Rubber TA-32	ESB-M4G92-A	-
Metal Bonding Adhesive TA-1	-	-
Motorcraft® Acid Neutralizer ZC-1-A	-	-
Motorcraft® Alkaline Neutralizer ZC-2-A	-	-
3MTM Perfect-It™ Show Car Liquid Wax 39026	-	-
Motorcraft® Detail Wash ZC-3-A	-	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Premium Undercoating ValuGard™ VG101, VG101A (aerosol)	-	-
Rust Inhibitor ValuGard™ VG104, VG104A (aerosol)	-	-
Plastic Bonding Adhesive TA-9	-	-
Roof Ditch Sealer Fusor® 122EZ, 3MTM 08307	-	-
Seam Sealer TA-2	-	-
Structural Foam (Medium) Fusor® 1908; obtain locally	-	-
Trim and Weatherstrip Adhesive Permatex® 81850 or equivalent	-	-

General Equipment
3 Phase Inverter Spot Welder 254-00002
Compuspot 700F Welder 190-50080

I4 Inverter Spot Welder 254-00014
Inverter Welder with MIG Welder 254-00015

**General Specifications -Welding Specifications**

Item	Specification
Plug Weld Hole	8 mm (0.31 in)
Weld Wire ER70S-3 or equivalent	0.9-0.11 mm (0.035-0.045 in)

**Torque Specifications**

Description	Nm	lb-in
Ballistic door panel bolts	12	106

**Weld Nugget Chart**

Test Thickness of Metal (mm)	Nugget Size
0.7 + 0.7	4.3 mm (0.16 in)
0.7 + 0.7 + 0.7	4.3 mm (0.16 in)
0.9 + 0.9	4.7 mm (0.18 in)
0.9 + 0.9 + 0.9	4.7 mm (0.18 in)
1.0 + 1.0	5.2 mm (0.2 in)
1.0 + 1.0 + 1.0	5.2 mm (0.2 in)
2.0 + 2.0	7.1 mm (0.27 in)
2.0 + 2.0 + 2.0	7.1 mm (0.27 in)
3.0 + 3.0	8.7 mm (0.34 in)
3.0 + 3.0 + 3.0	8.7 mm (0.34 in)
3.0 + 0.7	4.3 mm (0.16 in)
0.7 + 3.0 + 1.0	5.2 mm (0.2 in)
2.0 + 2.0 + 0.7	4.3 mm (0.16 in)
0.9 + 0.9 + 2.0	4.7 mm (0.18 in)
2.0 + 0.9 + 1.0	5.2 mm (0.2 in)
1.0 + 3.0 + 1.0	5.2 mm (0.2 in)

3.0 + 1.0 + 2.0	7.1 mm (0.27 in)
0.9 + 0.7 + 0.9	4.3 mm (0.16 in)

**Descriptions of Ford Steel Families**

Grade	Alloy Content	Heat Treatment	Typical Applications	Comments
Mild Steel, Bake Hardened, Solid Solution Strengthened	Low	Fully annealed/dead soft	Body panels (closures, floor pan, dash panel)	-
High-Strength Low Alloy (HSLA)	Low	Fully annealed/dead soft	Rails, structural members	Strengthened with fine particles and small grain size
Dual Phase	Medium (Manganese Silicon, Molybdenum Chromium)	Fully annealed/partially hardened	Rails, structural members	15-50% of structure is hard martensite
Ultra High Strength Steel (UHSS) (Martensitic, Boron)	Low	Fully hardened	Rocker reinforcements, door beams, bumper beams	100% of structure is hard martensite
Transformation Induced Plasticity Steel	High (Manganese, Phosphorous, Silicon, Aluminum)	Fully annealed/partially hardened	To be determined	Complex microstructure for high strength and ductility

**Ford Recommended Steel Repairability Matrix**

Grade	Trade Descriptions	Welding Method			Cold Repairs	Use of Heat for Repair	Temperature Range	Maximum Heat
		Metal Inert Gas (MIG)	Squeeze-Type Resistance Spot Welding (STRW)	MIG Braze				
Mild Steel	Mild	Yes	Yes	NA	Yes <sup>a</sup>	Yes	Up to 650°C (1,200°F)	90 sec. x 2
Laminate Steel	Quiet Steel	No	Yes	No	Yes <sup>a</sup>	NA	NA	NA
Bake Hardened	BH 180, BH210, BH 250, BH 280	Yes	Yes	Yes <sup>b</sup>	Yes <sup>a</sup>	Yes	Up to 650°C (1,200°F)	90 sec. x 2
Solid Solution Strength- ened	-	Yes	Yes	Yes <sup>b</sup>	Yes <sup>a</sup>	Yes	Up to 650°C (1,200°F)	90 sec. x 2

2010 Crown Victoria, Grand Marquis Workshop Manual

High- Strength Low Alloy (HSLA)	HSLA 250, HSLA 350, HSLA 550	Yes	Yes	Yes <sup>b</sup>	Yes <sup>a</sup>	Yes	Up to 650°C (1,200°F)	90 sec. x 2
Dual Phase = 600 MPa Ultimate Tensile Strength	DP 500, DP 600	Yes	Yes	Yes <sup>b</sup>	Yes <sup>a</sup>	No	NA	NA
Dual Phase = 600 MPa Ultimate Tensile Strength (particular to 780 and 980 grades) <sup>c</sup>	DP 700, DP 780, DP 900	Yes <sup>d</sup>	Yes	Yes <sup>b</sup>	No	No	NA	NA
Ultra High Strength Steel (UHSS) (Martensitic, Boron) <sup>e</sup>	Boron	Yes <sup>a</sup>	Yes	Yes <sup>b</sup>	No	No	NA	NA
Transform- ation Induced Plasticity (TRIP) Steel	TRIP 590, TRIP 780, TRIP 980	NA	NA	NA	NA	NA	NA	NA

<sup>a</sup> Cold repairs can be performed if damage excludes kinks. May section only if approved procedure in workshop manual.

<sup>b</sup> MIG braze allowed for non-structural applications only.

<sup>c</sup> Dual phase steels DP 700, DP 780 and DP 980 must be replaced at factory joints, no sectioning unless approved procedure in workshop manual.

<sup>d</sup> For DP 980, use MIG plug welding only, no stitch welding.

<sup>e</sup> Boron components must be replaced at factory joints, no sectioning allowed.



**Body**

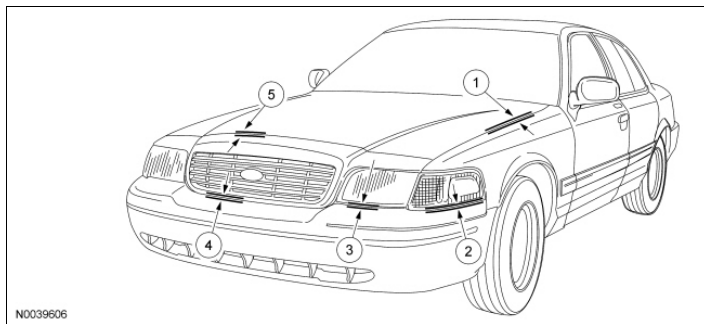
The body consists of the following:

- Body on full frame design
- Standard 2,913 mm (114.68 in) and long 3,066 mm (120.7 in) wheelbase
- Long wheelbase has a larger rear door/door frame opening
- High-Strength Low Alloy (HSLA), high-strength and mild steels
- Bolted, removable front fenders, hinged doors, luggage compartment lid and hood
- Steel radiator support
- Steel hood
- Steel fenders
- Steel doors
- Steel luggage compartment lid
- Sheet-Molded Composite (SMC) Grille Opening Panel (GOP)
- High-strength, roll-formed, bolt-on front and rear bumper beams
- Welded steel reinforcement used in rocker panel(s)
- Fire suppression system used on certain municipal and state law enforcement vehicles
- Fire suppression system frame contains welded steel reinforcement inserts in the rear frame rails
- Fire suppression system frame uses 21 additional reinforcements

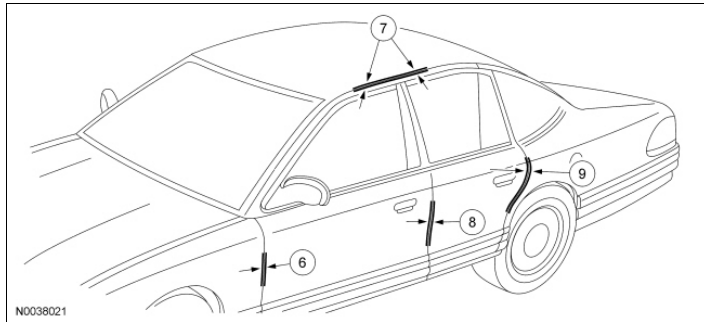
For dimensional information, refer to the following illustrations:

**Body Margins**

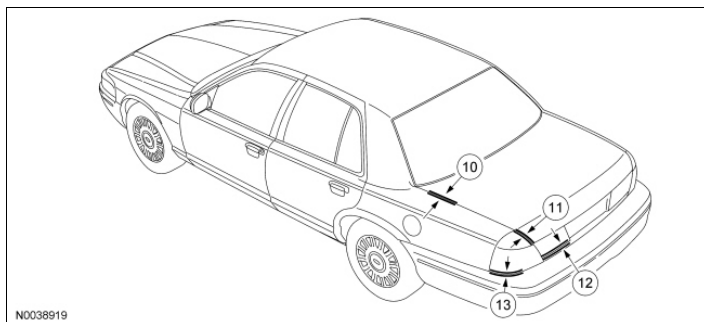
**NOTE:** Dimensions apply to right and left side.



Item	Description	Specification	Flushness Specification
1	Hood to fender	4.0 mm (0.15 in) $\pm$ 2.0 mm (0.07 in)	-
2	Fascia to lamp assembly	2.0 mm (0.07 in) $\pm$ 1.0 mm (0.03 in)	0.0 mm ( in) $\pm$ 2.5 mm (0.098 in)
3	Lamp assembly to fascia	6.0 mm (0.23 in) $\pm$ 2.0 mm (0.07 in)	-
4	Grille to fascia	6.0 mm (0.23 in) $\pm$ 2.0 mm (0.07 in)	-
5	Hood to grille opening panel	4.0 mm (0.15 in) $\pm$ 2.0 mm (0.07 in)	0.7 mm (0.027 in) $\pm$ 1.5 mm (0.059 in)

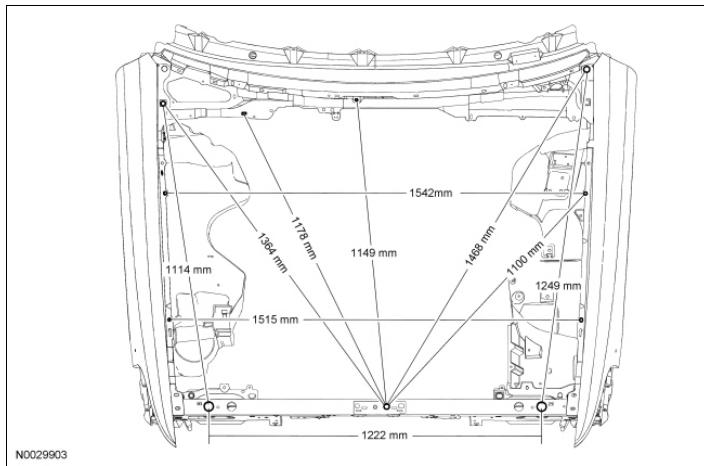
**Body Margins****NOTE:** Dimensions apply to right and left side.

Item	Description	Specification	Flushness Specification
6	Door to fender	4.0 mm (0.15 in) $\pm$ 2.0 mm (0.07 in)	0.0 mm ( in) $\pm$ 2.0 mm (0.078 in)
7	Door(s) to roof	5.0 mm (0.19 in) $\pm$ 2.0 mm (0.07 in)	-
8	Front door to rear door	4.0 mm (0.15 in) $\pm$ 2.0 mm (0.07 in)	0.0 mm ( in) $\pm$ 2.0 mm (0.078 in)
9	Rear door to quarter panel	4.0 mm (0.15 in) $\pm$ 2.0 mm (0.07 in)	0.0 mm ( in) $\pm$ 2.0 mm (0.078 in)

**Body Margins****NOTE:** Dimensions apply to right and left side.

Item	Description	Specification	Flushness Specification
10	Quarter panel to luggage compartment lid	4.0 mm (0.15 in) $\pm$ 2.0 mm (0.07 in)	-
11	Lamp assembly to luggage compartment lid	6.0 mm (0.23 in) $\pm$ 3.0 mm (0.11 in)	-
12	Luggage compartment lid to fascia	9.0 mm (0.35 in) $\pm$ 3.0 mm (0.11 in)	-
13	Lamp assembly to fascia	5.0 mm (0.19 in) $\pm$ 2.0 mm (0.07 in)	0.0 mm ( in) $\pm$ 2.0 mm (0.078 in)

**Underhood Dimensions****NOTE:** Measurements are obtained on center, unless otherwise indicated.

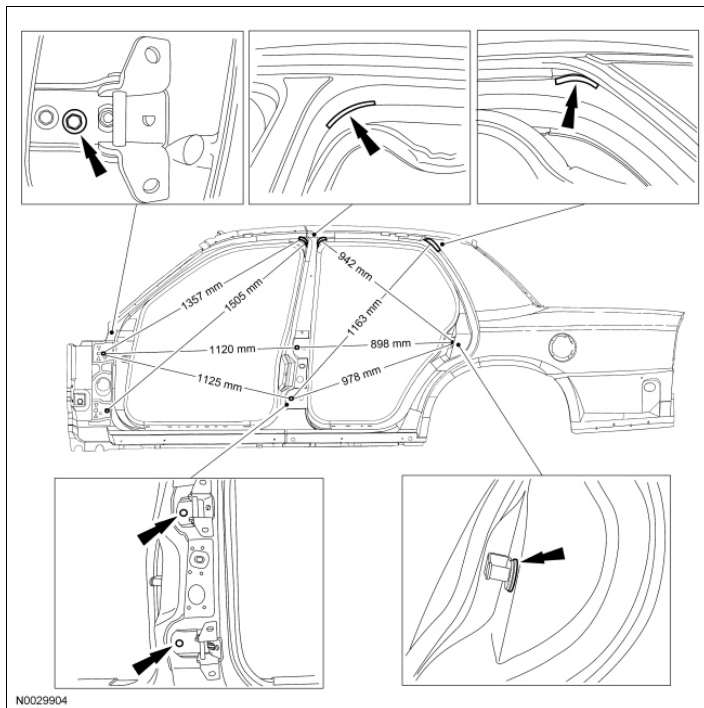


## Body Side Closure Dimensions

### Standard Wheelbase

**NOTE:** Measurements are obtained on center, unless otherwise indicated.

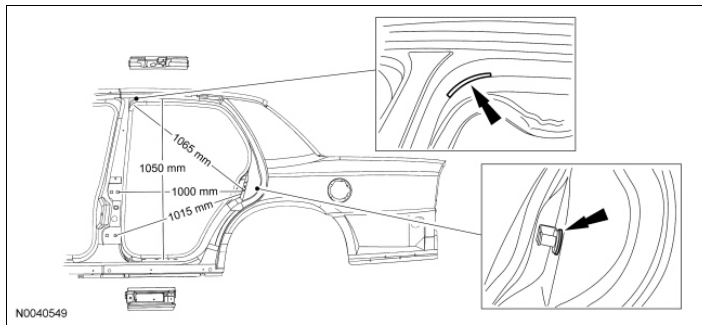
**NOTE:** Left side shown, right side similar.



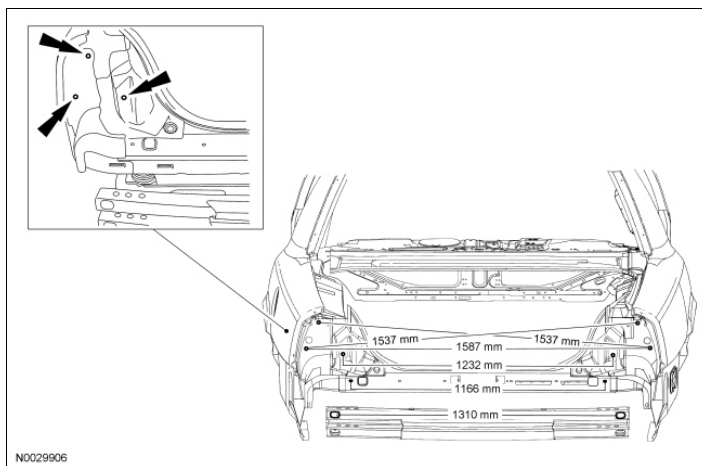
## Rear Opening Dimensions

**NOTE:** Measurements are obtained on center, unless otherwise indicated.

**NOTE:** Left side shown, right side similar.



**NOTE:** Measurements are obtained on center, unless otherwise indicated.



## Underbody Dimensions

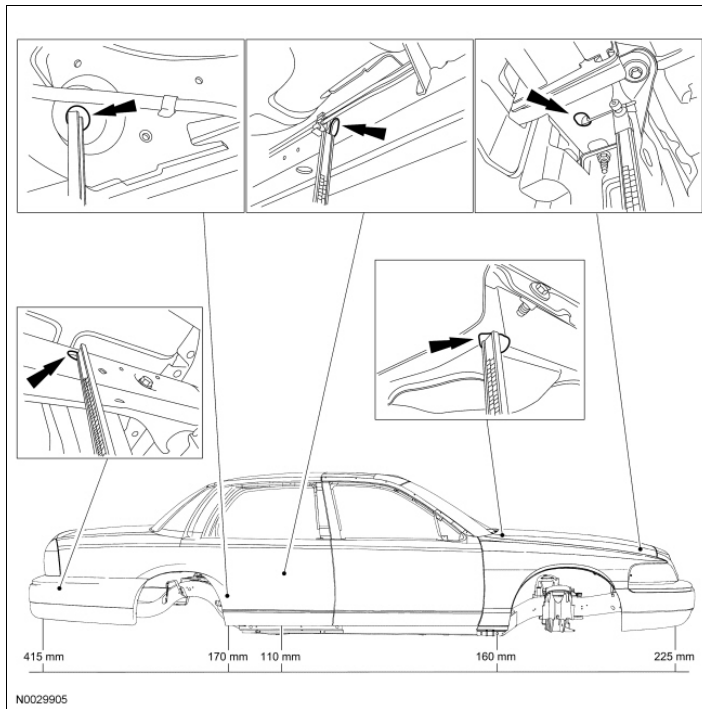
**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**NOTE:** Datum height determined measuring from holes and slots on center, unless otherwise indicated.

**NOTE:** Inset views indicated from left side of vehicle.

## Frame Datum Height

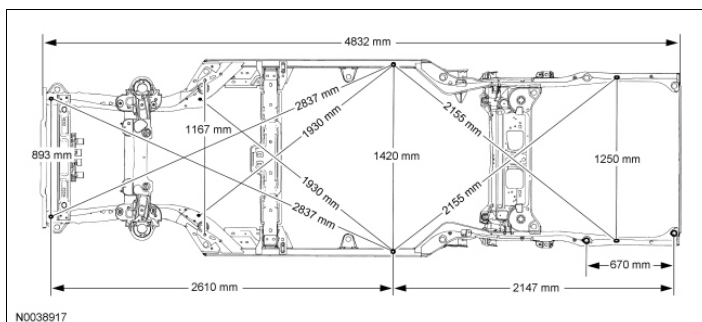


#### Frame Dimensions - Standard Wheelbase

**NOTICE:** A structural frame rail or unibody service kit may be available for this vehicle. If a kit is available, refer to the included instruction sheet for installation guidelines. If no instruction sheet is included with the service part, it is mandatory that the replacement section be installed as delivered at the original factory seam locations. Refer to **Frame Members** in this section.

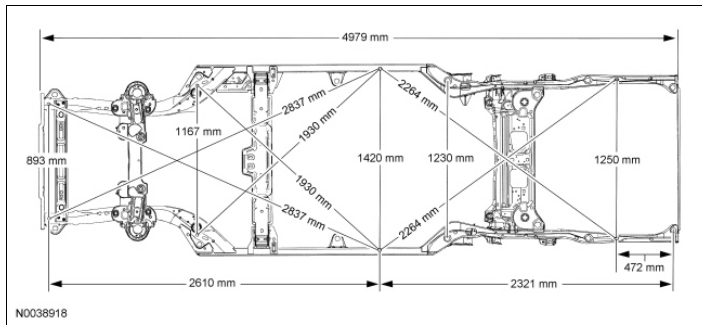
**NOTE:** All vehicle frames contain welded steel reinforcements, located in the rear frame rails near the control arm area. A welded steel insert is also contained in the front torque box area located at the A1 and A2 master locator holes. Care must be exercised when attempting to restore the vehicle to pre-accident dimensions, particularly if heat is applied when carrying out repairs to these areas. Vehicles with fire suppression systems have additional reinforcements located in the rear side members.

**NOTE:** Measurements are obtained on center, unless otherwise indicated.



#### Frame Dimensions - Long Wheelbase

**NOTE:** Measurements are obtained on center, unless otherwise indicated.

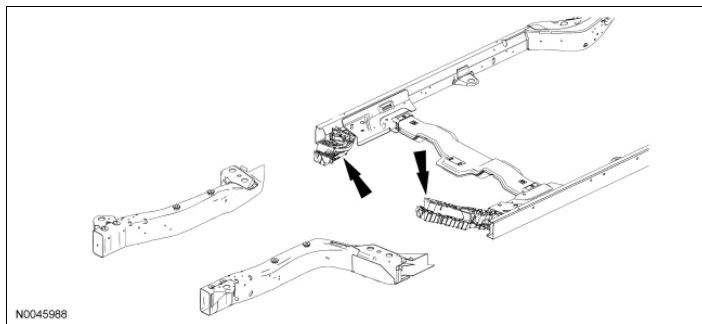


**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

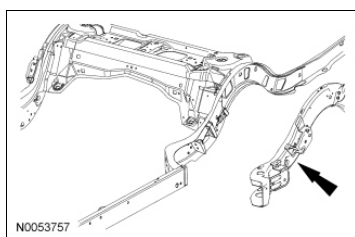
If equipped with a fire suppression system, repower the system.

If equipped with an air suspension system, reactivate the power supply. This can be accomplished by reconnecting the battery or turning on the air suspension service switch located in the luggage compartment LH side.

#### Nylon Inserts with Adhesive Location - Frame-Front



#### Steel Reinforcement and Structural Foam Location - Frame-Rear





**Welding Precautions - Steel****Material**

Item	Specification
Motorcraft Premium Undercoating PM-25-A (or equivalent)	-
Motorcraft Rust Inhibitor Aerosol PM-24-A (or equivalent)	-

General Equipment
3 Phase Inverter Spot Welder 254-00002
Compuspot 700F Welder 190-50080
I4 Inverter Spot Welder 254-00014
Inverter Welder with MIG Welder 254-00015

**Weld Nugget Chart**

Test Thickness of Metal (mm)	Nugget Size
0.7 + 0.7	4.3 mm (0.16 in)
0.7 + 0.7 + 0.7	4.3 mm (0.16 in)
0.9 + 0.9	4.7 mm (0.18 in)
0.9 + 0.9 + 0.9	4.7 mm (0.18 in)
1.0 + 1.0	5.2 mm (0.2 in)
1.0 + 1.0 + 1.0	5.2 mm (0.2 in)
2.0 + 2.0	7.1 mm (0.27 in)
2.0 + 2.0 + 2.0	7.1 mm (0.27 in)
3.0 + 3.0	8.7 mm (0.34 in)
3.0 + 3.0 + 3.0	8.7 mm (0.34 in)
3.0 + 0.7	4.3 mm (0.16 in)
0.7 + 3.0 + 1.0	5.2 mm (0.2 in)
2.0 + 2.0 + 0.7	4.3 mm (0.16 in)



0.9 + 0.9 + 2.0	4.7 mm (0.18 in)
2.0 + 0.9 + 1.0	5.2 mm (0.2 in)
1.0 + 3.0 + 1.0	5.2 mm (0.2 in)
3.0 + 1.0 + 2.0	7.1 mm (0.27 in)
0.9 + 0.7 + 0.9	4.3 mm (0.16 in)

### General Specifications

Item	Specification
Plug weld hole	8 mm (0.31 in)
Weld wire ER70S-3 or equivalent	0.9-1.1 mm (0.035-0.045 in)

**⚠ WARNING: Invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.**

The correct equipment and settings must be used when welding mild or high-strength steel. Metal Inert Gas (MIG) and Squeeze-Type Resistance Spot Welding (STRW) are the preferred methods. Surfaces must be clean and free of foreign materials.

- Correct eye protection must be worn.
- The correct protective clothing should always be worn.
- Adequate ventilation must be provided to avoid accumulation of poisonous gases.
- A test weld should always be carried out on a test sample.
- Use cleaning brushes and abrasive grinding wheels dedicated to the type of materials being welded.
- Follow equipment manufacturer's prescribed procedures and equipment settings for the type of welder being used. ER70S-3 or ER70S-6 wire are typically used for MIG welding steel.
- Disconnect the battery ground cable. Refer to [Section 414-01](#).
- Disconnect on-vehicle modules and protect them from possible heat damage and electrical currents when welding.
- Corrosion protection must be restored whenever bare metal repairs are made. Refer to [Restoring Corrosion Protection Following Repair](#) in this section.
- Adequate power supply needs to be used to make sure of correct equipment performance.
- Factory spot welds may be substituted with either STRW or MIG plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.
- Vehicles equipped with optional safety canopy require removal of these components prior to any welding procedures being carried out in the roof-line or body side areas of the vehicle. Refer to [Section 501-20B](#).



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## Sealers

**⚠ WARNING: Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.**

The correct sealing of joints is essential to repairing the vehicle correctly. Sealers are used to prevent wind noise, water leaks, exhaust fumes and dust from entering the vehicle. They also provide anti-corrosion barriers. Sealers are applied to areas such as door and rear compartment hem flanges, wheelhouse, quarter outer, floor, cowl, roof and other panel-to-panel attaching points. The following joint sealers are recommended for use depending upon the application:

- **Brushable Seam Sealer** - A sealer intended to restore the original brushed seam appearance. It is used to seal lap joints in sheet metal that are spot welded (for example, floorpans and cowl). Use a product obtained locally.
- **Roof Ditch Sealer** - A self-leveling sealer used for drip rails, roof seams, quarter panels to rear deck and for water leaks.
- **Seam Sealer** - Heavy-bodied, non-sag adhesive/sealer for use on standing cosmetic seams, truck bed seams, tooled door skin seams and floor pans. Also used for water leaks and noise concerns.

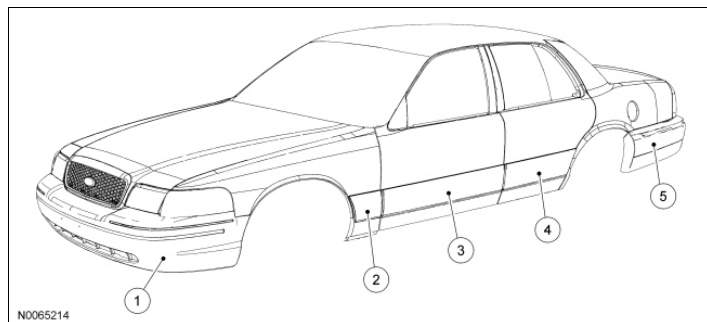
Sealers should remain flexible after curing and must be paintable. Follow the manufacturer's directions for correct application of these materials.

Any damage to originally sealed joints should be repaired by resealing. Along with attaching points of new panels, open joints that require bridging of sealer to close a gap should be sealed using a heavy-bodied sealer.

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**Plastic Components****Exterior Painted Plastic Components - Crown Victoria, Grand Marquis**

**NOTE:** The following illustration(s) are not all-inclusive of trim levels available. The actual trim level of the vehicle will determine the viability of carrying out a plastic repair.



Item	Part Number	Description
1	17D957	Bumper cover (front) - Thermoplastic Olefin (TPO)
2	20879B LH/ 20878B RH	Door moulding - TPO
3	20878A LH/ 20879A RH	Door moulding - TPO
4	25557B LH/ 25556B RH	Door moulding - TPO
5	17K835	Bumper cover (rear) - TPO

Several considerations will determine viability of plastic repair procedure(s):

- Is the damage cosmetic or structural?
- Can the repair be carried out on the vehicle?
- Is the part readily available?
- Is component repair the most cost effective method?
- Can the component be economically restored to original strength and appearance?
- Will the repair provide for the fastest, highest quality repair?

Several types of plastic are in use for automotive application. However, all plastics will fall into 2 primary categories of thermoplastic or thermosetting plastic.

**Thermosetting Plastic**

Generally, thermosetting plastics are made with 2-part thermosetting resins. When mixed together, heat is generated, producing a cure that is irreversible. Because of this, thermosetting plastics will require the use of a 2-part adhesive for repair.

**Sheet-Molded Compound**

Sheet-Molded Composite (SMC) is a type of thermosetting plastic that uses glass fibers or nylon fibers in combination with thermosetting polyester resins. When fully cured, SMC is strong and rigid.

SMC is similar to, but not identical to fiberglass. Ford Motor Company uses SMC in components such as fenders, hoods and liftgates.

### **Thermoplastic Compounds**

Thermoplastic compounds are manufactured by a process that is reversible. Thermoplastics can be remolded repeatedly by reheating. This characteristic of thermoplastics makes plastic welding a possible repair alternative. A repair of thermoplastic compounds is still possible through the use of 2-part adhesive and filler repair materials and reinforcements as needed. Thermoplastics are widely used in interior trim components, wheel flares, body side cladding and bumper covers.

### **Polyolefin**

Polyolefins fall into the family of thermoplastics with one unique characteristic: an oily or waxy feel to the material when sanded or ground. Polyolefin lends itself very well to remolding through the use of heat. Because of this, components made of this material lend themselves well to the possibility of plastic welding. Most adhesive repair materials and paint will not bond to the surface of a polyolefin unless an adhesion promoter specially formulated for plastic is first applied to the exposed raw surface. Otherwise, polyolefins are repaired like most other thermoplastics. Some typical uses of polyolefins are bumper covers, fan shrouds and wheel housings.

Correct identification of the various types of plastic is necessary to select the appropriate repair method(s) to carry out high quality plastic repairs. For information, refer to Plastics Identification in this section.

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**Adhesives**

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**Material**

Item	Specification
Clear Silicone Rubber TA-32	ESB-M4G92-A
Metal Bonding Adhesive TA-1	-
Plastic Bonding Adhesive TA-9	-
Seam Sealer TA-2	-
Trim and Weatherstrip Adhesive TA-14-A	-

Adhesives are used in a variety of applications. Typical uses for adhesives include roof panels, door skins and quarter panels. Trim applications include body side mouldings, emblems, stationary glass and weatherstripping. Combination sealer/adhesives are also used. Surface preparation is critical to a high quality repair. Following the label instructions for the product is essential.

Work in a well-ventilated area and protect adjacent surfaces when working with adhesives. The use of eye protection and protective clothing is also recommended when working with adhesives. Carry out a trial fit, mark and align the surfaces before bonding the materials together.

Seam sealers and corrosion protection may be necessary once the adhesive(s) has cured, depending on the application. The following is a list of adhesives recommended for certain types of applications:

- Metal Bonding Adhesive - For bonding cold-rolled steel, galvanized steel, aluminum and correctly prepared E-coat. It is used for door skin and roof panel replacement and OEM structural adhesive replacement.
  - Plastic Bonding Adhesive - For bonding a variety of plastics to plastics and plastics to primed, painted or E-coated metals. Also for general purpose bonding of trim components.
  - Seam Sealer - Heavy-bodied, non-sag adhesive/sealer for use on: standing cosmetic seams, truck bed seams, tooled door skin seams and floor pans.
  - Trim and Weatherstrip Adhesive - For use on body side moulding, emblems, trim, bumper impact strips and carpeting.
  - Clear Silicone Rubber - Used for sealing water leaks, noise concerns, remounting trim and repairing torn weatherstripping.
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## Sound Deadeners and Insulators

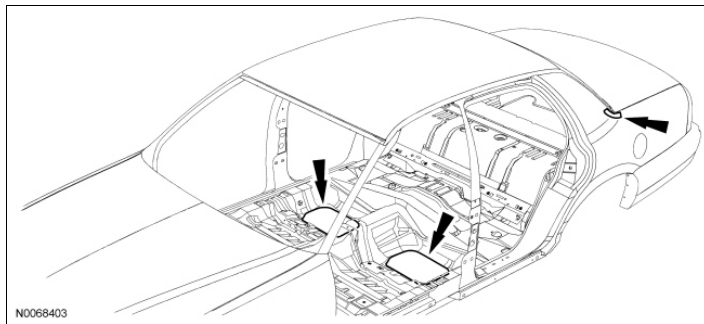
**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Mastic is made of a combustible material and should be removed prior to carrying out welding procedures to the area. Heat zones from welding near the mastic may cause the mastic material to burn.

**NOTICE:** Corrosion protection must be restored to the area **AFTER** the mastic material is applied. Corrosion protection products may be wax based and loss of adhesion may occur.

**NOTE:** To restore the vehicle to design intent, missing or damaged sound deadeners and insulators should be installed with the correct service replacement component.

**NOTE:** The following illustration serves as a reference to indicate mastic patch (butyl pad) locations. Additional insulators and sound deadeners are used beyond those indicated in the illustration.



1. Whenever replacement of an existing mastic insulator is carried out, the surface must be thoroughly cleaned to make sure correct adhesion will occur. The surface should be 10°C (50°F) or greater before applying the mastic. The use of a heat gun to warm the metal surface will aid in adhesion.
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**Sectioning Guidelines****General Equipment**

3 Phase Inverter Spot Welder 254-00002
Compuspot 700F Welder 190-50080
I4 Inverter Spot Welder 254-00014
Inverter Welder with MIG Welder 254-00015

**Material**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Premium Undercoating ValuGard™ VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGard™ VG104, VG104A (aerosol)	-
Seam Sealer TA-2	-

**Standard Wheelbase**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

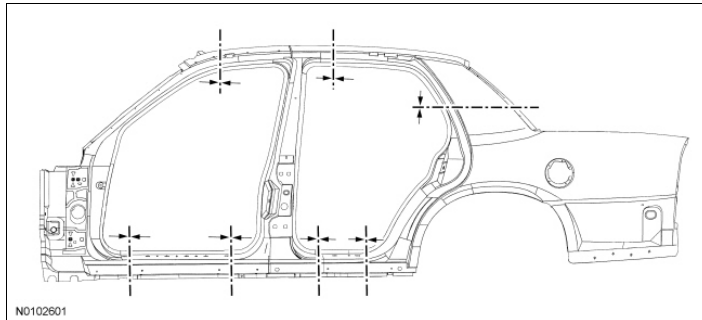
**⚠ WARNING:** Invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

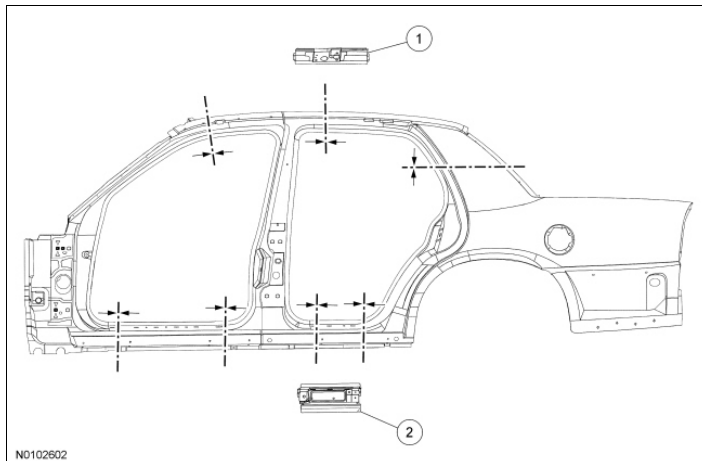
**⚠ WARNING:** On vehicles equipped with Safety Canopy® options, prior to carrying out any sectioning repairs near the roof line or sail panel areas of the vehicle, remove the Safety Canopy® module and related components. Failure to comply may result in accidental deployment or damage to

the Safety Canopy®. Refer to **Section 501-20B**. Failure to follow these instructions may result in serious injury to technician or vehicle occupant(s).

**⚠ WARNING:** Do not carry out body side sectioning repairs in areas of door hinge or striker anchoring points. Welding within 50 mm (1.96 in) of door hinge or striker locations may compromise structural integrity during a collision. Failure to follow these instructions may result in serious injury to vehicle occupant(s).



### Long Wheelbase



Item	Part Number	Description
1	27C91 LH/ 27C90 RH	Quarter panel upper rear extension
2	27C91 LH/ 27C90 RH	Quarter panel lower rear extension

**⚠ WARNING:** Collision damage repair must conform to the instructions contained in this workshop manual. Replacement components must be new, genuine Ford Motor Company parts. Recycled, salvaged, aftermarket or reconditioned parts (including body parts, wheels or safety restraint components) are not authorized by Ford.

Departure from the instructions provided in this manual, including alternate repair methods or the use of substitute components, risks compromising crash safety. Failure to follow these instructions may adversely affect structural integrity and crash safety performance, which could result in serious personal injury to vehicle occupants in a crash.

**NOTE:** Factory spot welds may be substituted with either Squeeze-Type Resistance Spot Welding (STRW) or Metal Inert Gas (MIG) plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.



**NOTE:** Observe prescribed welding procedures when carrying out any body side section repair. For additional information, refer to Welding Precautions - Steel in this section.

**NOTE:** When it is necessary to carry out weld-bonding procedures, refer to Weld-Bonding in this section.

1. Drill out the spot welds of the damaged panel to be sectioned. Using a cut-off wheel, reciprocating saw or plasma cutter, cut through the damaged area of the outer panel only and remove the section to be replaced. Clean metal surfaces with metal surface prep or equivalent prior to welding.
  2. Corrosion protection needs to be restored whenever it is necessary to sand or grind through painted surfaces or E-coat, or when bare metal repairs are carried out. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.
    - Make sure horizontal joints and flanges are correctly sealed with seam sealer to prevent moisture intrusion. Water and moisture migrate to horizontal joints and corrosion tends to occur more rapidly in these areas. Metal surfaces must be clean and dry before applying seam sealer.
  3. When welding overlapping surfaces or substrates, apply a weld-through primer between the surfaces prior to welding.
  4. If equipped with air suspension, reactivate the power supply. This can be accomplished by reconnecting the battery or turning on the air suspension service switch located in the luggage compartment on the LH side.
  5. Proceed with the refinish process following Ford-approved paint guidelines. Apply corrosion protection materials as required to the repair area.
-

**Restoring Corrosion Protection Following Repair**

## Special Tool(s)

 ST3049-A	Rust Inhibitor Installation Kit 286-00002
 ST3048-A	Undercoating Spray Gun 286-00001

## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Premium Undercoating ValuGard™ VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGard™ VG104, VG104A (aerosol)	-

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Drilling access holes in body panels is not recommended. Drilling holes will break the original paint finish and promote corrosion.

**NOTE:** Corrosion protection needs to be restored whenever it is necessary to sand or grind through painted surfaces or E-coat, or when bare metal repairs are made.

**NOTE:** Refer to product label for preparation and handling instructions.

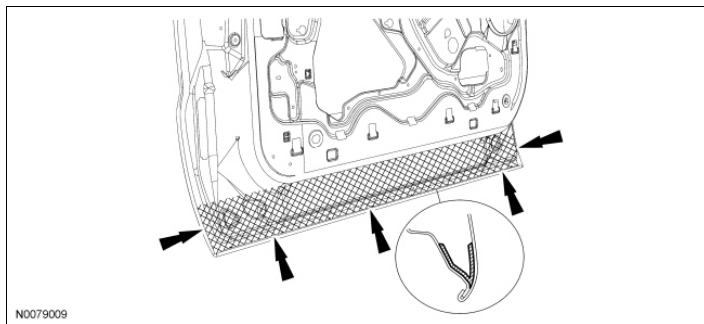
1. The surfaces must be free of oil, dirt and other foreign material. Carry out the process in the following sequence.
  1. Thoroughly clean and degrease metal surfaces using metal surface prep to remove wax and grease.
  2. For best results, the vehicle should be at room temperature. Attach the rust inhibitor canister to the Rust Inhibitor Installation Kit 286-00002.
  3. Rust inhibitor should be applied after the welding and refinishing process. Product cannot be welded through.
  4. Air pressure setting for applicator gun is 448-517 kPa (65-75 psi).

- ◆ Use the long wand when spraying enclosed areas. The spray nozzle provides a 360-degree spray pattern. Insert the wand as far as possible into the access hole, pull the trigger and wait 2-3 seconds and slowly pull the wand out of the access hole.
  - ◆ The short, hook-shaped wand sprays in one direction and must be rotated to provide complete coverage.
  - ◆ Apply the material in light mist coats.
  - ◆ Material displaces moisture.
5. Clean up any overspray with a mild solvent such as mineral spirits or bug and tar remover.

**NOTE:** The following illustrations provide typical applications of body seams and spot welded flanges and are not vehicle specific.

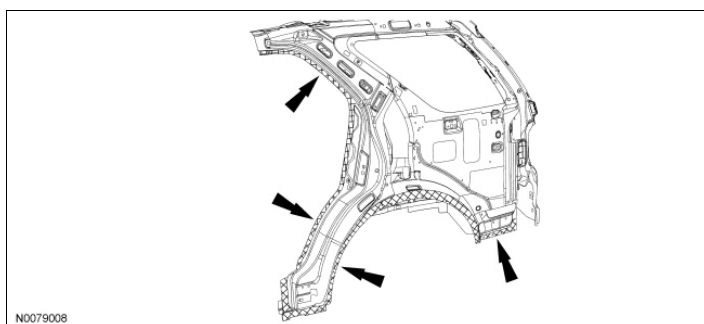
2. **NOTE:** Door assembly lower view.

Apply rust inhibitor as shown to the inside of the door shell on all the interior metal surfaces using the most suitable applicator wand. Apply material to the exposed edges after carrying out the welding process. Make sure horizontal surfaces are well protected as they are more susceptible to corrosion. Keep door drain holes clear to prevent moisture buildup.



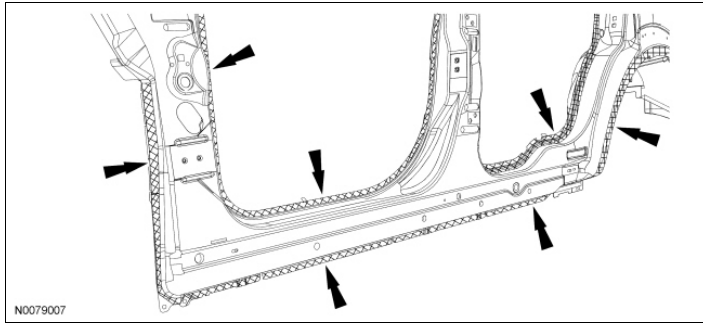
3. **NOTE:** Quarter panel inner view.

Apply rust inhibitor to the closed channel portion of the spot weld flange areas using the short, hook-shaped wand. Apply material to the exposed edges after carrying out the welding process. Make sure horizontal surfaces are well protected as they are more susceptible to corrosion.



4. **NOTE:** Door frame opening view.

Apply rust inhibitor to the closed channel portion of the spot weld flange areas using the short, hook-shaped wand. Make sure horizontal surfaces are well protected as they are more susceptible to corrosion.



### Body and Frame Undercoating

1. **⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not allow undercoating on powertrain components. Failure to follow these instructions may result in incorrect operation of these components.

**NOTE:** Refer to product label for preparation and handling instructions.

**NOTE:** Avoid high-pressure water spray cleaning to treated underbody area for 24 hours.

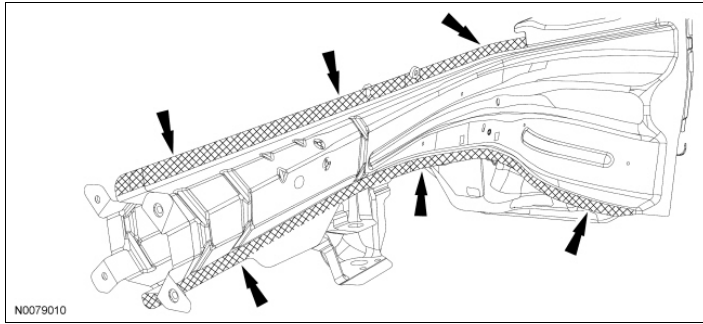
Wire brush the area and make sure the surfaces are free of oil, dirt and other foreign material. Carry out the undercoating process in the following sequence.

1. Thoroughly clean and degrease metal surfaces using metal surface prep to remove wax and grease.
2. For best results, the vehicle should be at room temperature.
  - ◆ Canister attaches directly to the dispensing gun. Attach the undercoating canister to the Undercoating Spray Gun 286-00001.
3. Undercoat should be applied after the welding and refinishing process. Product cannot be welded through.
4. Air pressure setting for applicator gun is 552-621 kPa (80-90 psi).
  - ◆ Apply light mist coats, applicator sprays in fogging pattern.
  - ◆ Material displaces moisture.
5. Clean up any overspray with a mild solvent such as mineral spirits or bug and tar remover.

**NOTE:** The following illustrations provide typical applications to frame rails and are not vehicle specific.

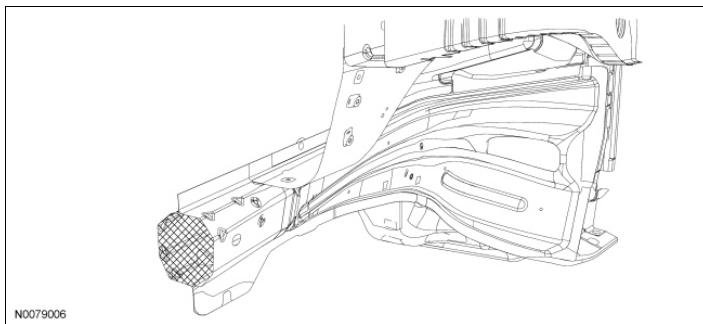
2. **NOTE:** Frame rail exterior spot-weld flange view.

Apply undercoat material to the exterior exposed edges after carrying out the welding and refinishing process.



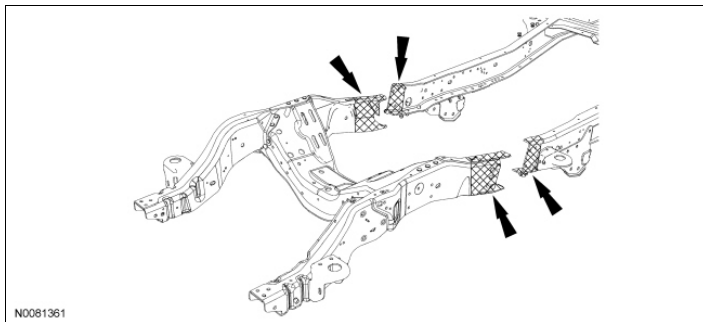
3. **NOTE:** Cross section view of typical unibody frame rail shown.

Apply rust inhibitor to the inner surfaces of the rail after carrying out welding process. Use the long wand and insert as far as possible, depress trigger and wait 2-3 seconds and slowly pull the wand to make sure the area is completely fogged.



4. **NOTE:** Full frame vehicle, front rail-to-mid rail section repair shown.

Apply undercoat material to the exposed surfaces after carrying out the welding process. Make sure to completely cover any bare metal areas.







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**Refinishing - Environmental Damage**

## Material

Item	Specification
Motorcraft® Acid Neutralizer ZC-1-A	-
Motorcraft® Alkaline Neutralizer ZC-2-A	-
3MTM Perfect-It™ Show Car Liquid Wax 39026	-
Motorcraft® Detail Wash ZC-3-A	-

**Iron Oxide (Rail Dust) or Acid Rain Decontamination**

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** In extreme cases of contamination, the vehicle may require refinishing. To avoid paint failure, follow the appropriate decontamination procedure prior to carrying out any panel refinishing procedure.

**NOTE:** Iron oxide contamination appears as tiny rust spots on horizontal surfaces and in severe cases can be felt. This damage is typically caused from rail shipment, storage near railroad tracks or fallout from industrial manufacturing facilities.

**NOTE:** Acid rain contamination can be identified as water spotting and, in severe cases, staining within the water spots.

1. **NOTICE:** Never paint over iron particles as rust spots will reoccur. Use only the recommended decontamination procedure detailed below.

Rinse any dust, dirt and foreign material from the vehicle body with cold water. Flush liberally.

2. Prepare the acid neutralizer by mixing 8 parts of water to 1 part neutralizer in a bucket.
3. **NOTICE:** To avoid paint failure, do not allow the product to dry on the vehicle.

**NOTE:** Use a separate wash mitt for each product applied to the vehicle.

Working quickly and beginning at the top of the vehicle and working to the sides, apply the acid neutralizer mix to the entire vehicle. Keep the vehicle wet with the solution and lightly agitate for 5 to 7 minutes. Continue around the vehicle 4 to 5 times. For severe conditions, work the product for up to 8 minutes.

4. Rinse the vehicle completely with cold water to remove the product.
5. Dry only the horizontal surfaces of the vehicle, do not dry the glass at this time.
6. **NOTICE: To avoid damage to the paint surface, do not apply the alkaline neutralizer directly to the vehicle plastic trim.**

**NOTE:** Use a separate wash mitt for each product applied to the vehicle.

**NOTE:** Alkaline neutralizer is a ready-to-use product. Do not mix with water.

Pour the alkaline neutralizer into a squirt bottle and apply the solution to a clean wash mitt.

7. **NOTICE: To avoid paint failure, do not allow the alkaline neutralizer to dry on the vehicle.**

Apply the product to the vehicle keeping the solution wet and lightly agitate for 5 to 7 minutes. For severe conditions, work the product for up to 8 minutes.

8. Rinse the vehicle completely with cold water to remove the product.
9. Prepare the detail wash by mixing 29.5 ml (1 oz) with 3.78L (1 gal) of water.
10. Using a clean wash mitt, shampoo the entire vehicle and rinse with cold water. Dry the vehicle completely.
11. Visually inspect the paint surface for any remaining evidence of ferrous metal particles. Repeat procedure as necessary.

### Surface Finishing Following Decontamination

1. **NOTICE: When attempting to affect a repair by buffing, polishing or color sanding, do not remove an excess of 0.3 mil of paint film or refinishing will be required.**

**NOTE:** Acid rain discoloring or etching may require color sanding in addition to buffing and polishing. In extreme cases, refinishing may be required if the following procedure does not restore the vehicle finish.

**NOTE:** Do not intermix buffing products. Use only one manufacturer's product.

**NOTE:** Always follow the manufacturer's product usage sequence. Use the appropriate buffing or polishing pad at the recommended buffing speed as specified by the product manufacturer.

Apply rubbing compound to the vehicle surface as recommended by the product manufacturer.

2. Apply machine glaze to the vehicle surface as recommended by the product manufacturer.
3. Use an alcohol and water mixture (1 to 1) to clean the buffed and polished areas. Verify removal of scratches and swirls before the application of the final polish.

4. Apply a final polish material by hand, with a dual-action sander and foam pad, or with an orbital polisher and appropriate polishing bonnet.
  5. Wash and dry the vehicle.
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**Refinishing - Manufacturing Damage**

## Material

Item	Specification
3MTM Perfect-It™ Show Car Liquid Wax 39026	-
Motorcraft® Detail Wash ZC-3-A	-

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** To avoid overspray damage to adjacent panels, protect adjacent areas/substrates when preparing for and during refinishing.

**NOTE:** Peeling/delamination concerns can be described as lack of adhesion, either between the substrate and topcoats or between individual coats of paint.

1. Wash the repair area with detail wash or pH-neutral soap and water.
2. Remove any trim, emblems and hardware from the area to be repaired.
3. **NOTE:** All delamination must be removed.

Sand or media blast the damaged surface, keeping the repair area as minimal as possible.

4. Treat any bare metal surface to prevent flash corrosion, and prime and block sand as necessary prior to refinishing.
  5. Mask the adjacent panels to protect from overspray.
  6. Spot repair the base coat as necessary, following the paint manufacturer's prescribed procedures.
  7. Following the paint manufacturer's prescribed procedure, apply clear coat to the entire panel.
-



**Plastics Identification**

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**NOTE:** Identification of the various plastic types is necessary to select the appropriate repair methods to make high quality plastic repairs. Plastics can generally be broken down into 2 categories, thermoplastics and thermosetting plastics. Thermoplastics can be remolded by heating. This makes plastic welding a possible repair alternative.

1. **NOTE:** In some instances, a code or material designation is stamped indicating the plastic type.

Thermoplastics are solvent reactive. Types of thermoplastics include Thermoplastic Olefin (TPO), Polyvinyl Chloride (PVC) and Acrylonitrile Butadiene Styrene (ABS). Polyolefins have an oily or waxy appearance. Examples include some bumper covers, stone shields, fender aprons and fan shrouds. Polyolefins require an adhesion promoter prior to carrying out any refinish procedure.

- To determine if the part is a polyolefin, grind the damaged area in an out-of-sight area. Grinding a polyolefin will melt and smear the plastic and leave a ragged edge. If the part is non-polyolefin, the area will grind or sand smoothly, producing a powdery dust.

**Rigid Plastic Parts**

Code	Family Name	Common Trade Name	Typical Application
ABS	Acrylonitrile Butadiene Styrene	ABS, Cicolac, Lustran, Kralistic	A-Pillars, Consoles, Grilles
SMC	Sheet Molded Composite	SMC	Body Panels

**Flexible Plastic Parts**

Code	Family Name	Common Trade Name	Typical Application
RRIM	Reinforced Reaction Injection-Mold Material PUR	RRIM	Fascias, Body Panels, Body Trims
TPO	Thermoplastic Polyolefin	Polytrope, Renflex, Santropren Telcar, Vistaflex, ETA, Apex, TPO	Bumpers, End Caps, Rubber Strips, Sight Shields, Claddings, Interior B-Post

2. Polyolefin plastic can also be identified by placing a small sliver in a container of water, if the sample floats, it is a polyolefin plastic. A non-polyolefin will sink when placed in a container of water.
3. Generally, thermosetting plastics are rigid or semi-rigid. Sheet-Molded Composite (SMC) is reinforced with glass and other fibers and are strong and rigid. SMC is used for large panels such as hoods, liftgates, fenders and quarter panels.
  - A burn test can be a reliable method to determine if a plastic is a thermosetting plastic. Extreme care must be exercised when using this method.
    - ◆ **NOTICE: The component must be isolated away from the vehicle and all combustible materials to perform this test.**

Apply an open flame to the corner of the damaged component. If the material crystallizes and becomes hard, it is a thermosetting plastic.

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## Plastics Refinishing

### All Components

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not paint any air bag module trim covers or deployment doors. Paint may cause the air bag to deploy incorrectly. Failure to follow this instruction may increase the risk of serious personal injury or death in a crash.

**NOTE:** When using any Ford-approved refinishing product, it is recommended to stay within the same paint system throughout the process. For example, do not use one manufacturer's primers and another manufacturer's topcoats.

1. **NOTE:** Care must be used if applying heat to parts. Thermoplastics soften and tend to lose their shape when heated.

The first step for any repair or refinish procedure is to identify the type of plastic. Is it thermosetting or thermoplastic, grained or smooth? This will determine how it should be cleaned and prepared for refinishing. For additional information, refer to Plastics Identification in this section.

- It is essential that the correct cleaner is used, depending on which painting system is employed, solvent-based or water-based.
  - Clean part with warm water/mild detergent, then with plastic cleaner to remove wax, silicone and other contaminants. Do not allow parts to remain wet for extended periods.
  - As a general rule, if water beads on the part, it requires additional cleaning as all the manufacturing release agents have not been removed.
2. New parts may require baking in a spray booth or heating with heat lamps to release trapped solvents or mold release agents used in the manufacturing processes.

### Non-grained components

3. After cleaning, lightly sand with 600-grit or finer sandpaper. Remove sanding residue with plastic cleaner and wipe dry.

### Grained components

4. After cleaning, light use of a gray scuff pad is permissible providing the graining not be flattened. Remove sanding residue with plastic cleaner and wipe dry.

### All components

5. Apply a plastics adhesion promoter to any bare plastic part following manufacturer's recommendation. Throughout the refinish procedure, any time bare plastic is exposed for any reason, it is essential that adhesion promoter be reapplied to that area.
6. A sealer may be required to prevent wrinkling and lifting of the topcoat prior to carrying out the refinish procedure.

7. Flexible and non-flexible components should be refinished separately as a flex additive may be required when refinishing flexible parts (refer to the paint manufacturer's recommendation).
  8. It is recommended to carry out refinishing of exterior components on-vehicle (after cut-in) to control color match and blending to adjacent panels.
  9. Proceed with the refinish process and follow the Ford-approved paint system procedures. Steps may vary between paint manufacturers.
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**Weld-Bonding**

## General Equipment

3 Phase Inverter Spot Welder 254-00002
Compuspot 700F Welder 190-50080
I4 Inverter Spot Welder 254-00014
Inverter Welder with MIG Welder 254-00015

## Material

Item	Specification
Metal Bonding Adhesive TA-1	-
Motorcraft® Metal Surface Prep ZC-31-A	-
Rust Inhibitor ValuGard™ VG104, VG104A (aerosol)	-
Seam Sealer TA-2	-

**Weld-Bonding - Squeeze-Type Resistance Spot Welding (STRW) Method**

**⚠ WARNING:** Invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Collision damage repair must conform to the instructions contained in this workshop manual. Replacement components must be new, genuine Ford Motor Company parts. Recycled, salvaged, aftermarket or reconditioned parts (including body parts, wheels or safety restraint components) are not authorized by Ford.

Departure from the instructions provided in this manual, including alternate repair methods or the use of substitute components, risks compromising crash safety. Failure to follow these instructions may adversely affect structural integrity and crash safety performance, which could result in serious

**personal injury to vehicle occupants in a crash.**

**NOTE:** On door shells that are manufactured with structural adhesives only, weld bonding door skins is not recommended. Only metal bonding adhesive should be used.

**NOTE:** Weld-bonding is a method used to join metals using Squeeze-Type Resistance Spot Welding (STRW) or Metal Inert Gas (MIG) welding and structural adhesive. The steps listed in this procedure apply to both types of welding. STRW is the preferred method. MIG welding should only be used when areas to be welded cannot be accessed using STRW -type machinery.

**NOTE:** Factory spot welds should be substituted with either resistance spot welds or MIG plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.

1. Verify the vehicle is dimensionally correct on a frame machine. Straighten if necessary.
2. Remove damaged panels with an air saw or air chisel. Remove only large portions of the damaged panel. Avoid cutting into mating flanges or adjacent parts.
3. Drill out the spot welds using an appropriate spot-weld cutter and remove the remaining portions of the panel to be replaced.
4. Prepare any damaged flanges on the vehicle using hammer and dolly.
5. Grind the mating surface of the original flanges no greater than 25 mm (0.98 in) where the metal bonding adhesive will be applied.
  - Be sure to remove galvanizing on metal. Metal should have a shiny appearance.
  - Be careful not to damage the corners or thin the metal. The E-coat should also be removed on the opposite side of the flange only where the spot welds are to be placed. Clean surfaces with metal surface prep or equivalent.
6. Dry-fit and clamp the replacement service parts to verify a correct fit.
  - Remove the service part after verifying correct fit and alignment.
7. **NOTE:** The ends of welding clamps should be insulated on the ends using tape or similar material when welding is carried out.

Follow manufacturer's prescribed welding procedures and settings. For additional information, refer to Welding Precautions - Steel in this section.

8. Prepare the adhesive. Dispense a small amount of metal bonding adhesive from the cartridge to make sure of an even flow of both components. Attach the mixing tip and dispense a mixing tip length of adhesive to make sure of a correct mix ratio.
9. **NOTE:** Welding can be carried out anytime during the adhesive curing process, or after the adhesive is fully cured. Welder settings will vary when welding through wet adhesive versus welding through fully cured adhesive. Refer to welder manufacturer's recommended settings for welding through fully cured adhesive. It is recommended to place a shunt weld in an area with no adhesive to make sure of conductivity, particularly when welding through fully cured adhesive.

**NOTE:** Refer to the product label for handling and preparation instructions.

Create a test sample.

1. Prepare the metal and adhesive as described. Apply a 6-9 mm (0.23-0.35 in) bead of adhesive and weld the sample.
  2. Place the welded sample in a vice and carry out destructive weld tests by peeling the scrap metal apart using large lock-type pliers. Measure the weld nugget to determine that the nugget meets Ford weld nugget requirements. If the weld nugget does not meet required size, adjust welder settings until the correct weld nugget size is achieved.
  3. When the correct weld nugget size is achieved, the service part can be weld-bonded. For additional information, refer to the weld nugget table in Specifications in this section.
- 
10. Apply a 6-9 mm (0.23-0.35 in) bead of metal bonding adhesive to the vehicle prepared flange surface.
  11. Place the service part(s) in the correct position on the vehicle.
    - When positioned, do not pull the component away from the vehicle. If repositioning is necessary, slide the service part(s). This will make sure of correct contact between the components and adhesive.
  12. Clamp evenly and tightly. The adhesive contains glass beads which will prevent over-clamping the component.
  13. **NOTE:** Refer to product label for cure times and handling instructions. Clamps may be removed immediately after the component is welded.
- Wipe excess adhesive from the panel before it cures.
14. Finish any cosmetic section seams with fiber-filled body filler. Rough sand the filler, apply conventional body filler after the adhesive cures and block-sand the area.
  15. Use seam sealer wherever a cosmetic seam sealer is required.
  16. Mix and apply primer surfacer per Ford-approved paint recommendations.
  17. Mix and apply basecoat per Ford-approved paint recommendations.
  18. Mix and apply clearcoat per Ford-approved paint recommendations. Refinishing materials may be force-dried following paint manufacturer's recommendations.
  19. Apply anti-corrosion treatment to the repair area as required. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.

### **Weld-Bonding - Metal Inert Gas (MIG) Welding Method**

**⚠ WARNING:** Collision damage repair must conform to the instructions contained in this workshop manual. Replacement components must be new, genuine Ford Motor Company parts. Recycled, salvaged, aftermarket or reconditioned parts (including body parts, wheels or safety restraint components) are not authorized by Ford.

Departure from the instructions provided in this manual, including alternate repair methods or the use of substitute components, risks compromising crash safety. Failure to follow these instructions may adversely affect structural integrity and crash safety performance, which could result in serious personal injury to vehicle occupants in a crash.

**⚠ WARNING:** Invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct

**density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.**

**⚠ WARNING: Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.**

**⚠ WARNING: Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.**

**NOTE:** Metal Inert Gas (MIG) weld-bonding can be substituted as an alternative to Squeeze-Type Resistance Spot Welding (STRW). It may only be used to weld areas that are inaccessible to STRW machinery. However, when accessible, STRW is the preferred method.

**NOTE:** On door shells that are manufactured with structural adhesives only, weld-bonding door skins is not recommended. Only metal bonding adhesive should be used.

**NOTE:** Factory spot welds should be substituted with either resistance spot welds or MIG plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.

1. Remove damaged panels with an air saw or air chisel. Remove only large portions of the damaged panel. Avoid cutting into mating flanges or adjacent parts.
  - Drill out the spot welds using an appropriate spot-weld cutter and remove the remaining portions of the panel to be replaced.
2. After removing the damaged sheet metal panel(s), repair any damaged flanges on the vehicle using a hammer and dolly.
3. Using an appropriate grinder, carefully grind around the entire receiving flange area following the original welds. Be sure to remove all E-coat, paint or galvanized coating from the mating surfaces of the joint.
  - Be sure to remove galvanizing on metal. Metal should have a shiny appearance.
  - Be careful not to damage the corners or thin the metal. The E-coat should also be removed on the opposite side of the flange only where the spot welds are to be placed. Clean the surface with metal surface prep or equivalent.
4. Repeat the procedure from Step 3 on the mating surface of the replacement service part(s).
5. Prepare the new service panel for plug welds.
  - Using the original panel as a reference, drill or punch 8 mm (0.31 in) diameter holes in the exact number as the original spot welds. The holes should be positioned as close as possible to the original spot weld locations, without lining up exactly on top of an original spot weld site.
  - To make sure of correct weld performance, grind the immediate perimeter of the plug weld hole. Grind only in the area of the plug weld; this will keep corrosion to a minimum.
6. Dry-fit and clamp the replacement service parts to verify a correct fit and alignment.
  - Remove the service part after verifying correct fit and alignment.
7. The vehicle prepared flange areas where plug welds will be located must be kept free of adhesive.

Apply 25 mm (0.98 in) tape to the plug weld areas to prevent contamination from the adhesive.

8. Prepare the adhesive. Dispense a small amount of metal bonding adhesive from the cartridge to make sure of an even flow of both components. Attach the mixing tip and dispense a mixing tip length of adhesive to make sure of correct mix ratio.

9. **NOTE:** Refer to product label for cure times and handling instructions.

Apply a 6-9 mm (0.23-0.35 in) bead of adhesive to the vehicle prepared flange surface. Remove the tape from the plug weld areas.

10. Place the service part(s) in the correct position on the vehicle.
  - When positioned, do not pull the component away from the vehicle. If repositioning is necessary, slide the service part(s). This will make sure of correct contact between the components and adhesive.
11. Clamp evenly and tightly. The adhesive contains glass beads which will prevent over-clamping the component.
12. **NOTE:** Welding can be carried out anytime during the adhesive curing process or after the adhesive is fully cured.

**NOTE:** If welding will not be carried out immediately, refer to product label for cure times and handling instructions. Clamps may be removed immediately after the component is welded.

Wipe excess adhesive from the panel before it cures.

13. Finish any cosmetic section seams with fiber-filled body filler. Rough sand the filler, apply conventional body filler after the adhesive cures and block-sand the area.
  14. Use seam sealer wherever a cosmetic seam sealer is required.
  15. Mix and apply primer surfacer per Ford-approved paint recommendations.
  16. Mix and apply basecoat per Ford-approved paint recommendations.
  17. Mix and apply clearcoat per Ford-approved paint recommendations. Refinishing materials may be force-dried following paint manufacturer's recommendations.
  18. Apply anti-corrosion treatment to the repair area as required. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.
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**Plastics Repair**

## Material

Item	Specification
Plastic Bonding Adhesive TA-9	-

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always refer to Material Safety Data Sheet (MSDS) when handling chemicals and wear protective equipment as directed. Examples may include but are not limited to respirators and chemically resistant gloves. Failure to follow these instructions may result in serious personal injury.

1. In deciding whether to repair or install a new component, follow these guidelines.
  - Is a part readily available?
  - Can the damaged part be economically returned to its original strength and appearance, or will the labor cost exceed the cost of a new component?
  - Will repair provide for the fastest, highest quality repair?
2. **NOTICE:** Never apply solvents such as lacquer thinner or reducer at any stage of plastic repair. Solvents, cleaners and water are absorbed by many types of plastics and by the glass fibers used for reinforcements. If this occurs, the plastic may swell in the area of repair and cause the repair to fail. Remove cleaners and water quickly and use air and heat to speed up drying.

**NOTICE:** During the repair of many plastics and particularly polyolefin plastics, an adhesion promoter must be applied to the substrate to allow repair materials and paint to bond correctly. Reapplication is required when grinding or sanding through the sealer or primed layers.

**NOTE:** When possible, it is recommended to carry out as much of the plastic repair as possible on the vehicle. Parts mounted on the vehicle are held in correct alignment throughout the repair. Attempting to repair the part off the vehicle may cause misalignment. This could lead to failure of the repair.

Select the correct repair method by identifying the type of plastic being repaired. For additional information, refer to Plastics Identification in this section to determine the type of plastic being repaired.

3. **NOTE:** Always refer to the manufacturer's label directions for the type of repair materials, fillers and bonding agents being used as they are material specific.

Determine whether a reinforcement piece is needed as a backer on large repairs.

- Construct a reinforcement piece from a scrap piece of the type of plastic being repaired and follow manufacturer's label directions for the type of system being used.
- When repairing Sheet-Molded Composite (SMC), a reinforcement piece can be constructed using several layers of glass cloth saturated with resin or structural adhesive. The weave of the cloth or screening should be loose enough to allow the resin to thoroughly penetrate. Reinforcement should cover the entire area of damage and extend outward beyond the

damage or joint area.

### Sheet-Molded Composite (SMC) Panel Repair

**NOTE:** The following procedure applies to repair of structural cracks and large gouges. If damage is cosmetic, use of reinforcing cloth may not be necessary.

1. Panels to be repaired should be dry and at room temperature 18°C (65°F) to 24°C (75°F) prior to carrying out any repairs. Both sides of the panel must be thoroughly cleaned before sanding or grinding.
2. Cover the break in the SMC (front and back) with masking tape. This protects the damaged area from absorbing the prep cleaner and eliminates wicking of the cleaner through the fibers into the SMC .
3. Remove all waxes, silicones, dirt and road oils from the area surrounding both sides of the damaged area with a plastics wax and grease remover.
  - Remove the tape and sand the back of the repair area with an angle grinder, Dual Action (D/A) sander or by hand using 80-grit sandpaper. Remove all dust with a vacuum and tack cloth.
4. Create a reinforcing patch using a piece of scrap SMC that conforms well to the back of the damaged area or form a patch from fiberglass cloth.
  - Cut a section of cloth large enough to cover the repair, plus 25.4 mm (1 in) around the repair area.
  - Cut a section of plastic film backing approximately 25.4 mm (1 in) larger than the cloth. Lay the plastic on a smooth, flat surface where it will be used to create a pyramid patch.
5. Follow manufacturer's directions and apply plastic repair adhesive to the plastic film backing and smooth with plastic spreader to recommended thickness. Place the pre-cut fiberglass cloth on the adhesive-coated plastic film. Cover the cloth with a coat of repair adhesive and spread to the recommended thickness.
6. Apply the prepared patch to the backside of the panel and compress. Follow manufacturer's instructions for adhesive cure. Remove plastic film after adhesive cures and sand as necessary to remove roughness.
7. Remove masking tape from the front side of damaged area and grind down to the backing patch. Use an angle grinder with a 30- to 40-grit wheel. Make a gradual taper in the area, this will prevent bull's-eyes or read-through in the finished repair. Sand prepared area with a D/A sander or hand-sand with 80-grit sandpaper.
8. Build a pyramid patch using fiberglass cloth or equivalent and plastic repair adhesive. Following manufacturer's directions, apply patch to damaged area.
9. Rough-grind area to remove excess adhesive. Sand repair area with 80-grit sandpaper, making sure to cut slightly below the SMC finished surface. This will allow for a finish coat of plastic body repair material.
10. Apply a finish coat of plastic repair filler material per manufacturer's directions.
11. Finish-sand, prime and topcoat using Ford-approved paint systems.

## Thermoplastic Compounds

1. In deciding whether to repair or install a new component, follow these guidelines.
  - Is a part readily available?
  - Can the damaged part be economically returned to its original strength and appearance, or will the labor cost exceed the cost of a new component?
  - Will repair provide for the fastest, highest quality repair?
2. **NOTE:** The following steps are to be used as a guideline. Depending on what brand of adhesives or patch materials are used, procedures may vary slightly.

Thoroughly clean the damaged area with wax and grease remover formulated for use with plastics.
3. Hand sand the repair area with 80-grit sandpaper and remove any foreign material with compressed air.
4. Apply a plastics adhesion promoter per label directions to the repair area.
5. For small repairs, a plastic adhesive filler can be applied to the damaged area. Follow manufacturer's directions and build layers to form a thickness above the damaged area. This will allow the area to be sanded smooth.
6. To repair large holes or cracks, measure and cut a piece of fiberglass cloth or equivalent 25.4 mm (1 in) larger than the crack or hole.
  - Apply plastic repair adhesive to the damaged area and immediately apply fiberglass cloth into plastic adhesive for reinforcement. Apply additional plastic repair adhesive for strength and shape as required.
7. Contour and shape the repair as necessary with a D/A sander. Avoid sanding through the repair.
8. Finish-sand the area and carry out any required paint operations using Ford-approved paint systems.

## Tab Repair - Bumper

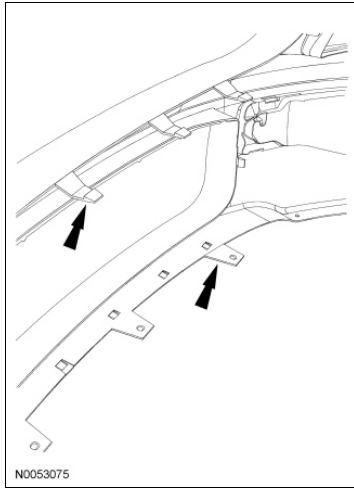
1. **NOTE:** Inspect the bumper cover to determine if part of it can be repaired to an acceptable level of quality of appearance, fit and durability. Will labor and material cost of the repair meet or exceed the cost of a new replacement bumper cover? If the bumper cover is determined to be repairable, proceed to the following steps.

**NOTE:** The following steps are to be used as a guideline. Depending on what brand of adhesives or patch materials are used, procedures may vary slightly.

Remove the affected bumper. For additional information, refer to Section 501-19 .

**NOTE:** Illustration is not vehicle specific.

2. Clean the broken tab(s) with a plastics wax and grease remover.



3. Hand sand the repair area with 80-grit sandpaper and remove any foreign material with compressed air.
  4. Apply a plastics adhesion promoter per label directions to the repair area.
  5. Measure and cut a patch of fiberglass cloth or equivalent large enough to form the front of the tab, then slope back in a wedge shape approximately 51 mm (2 in) from original tab.
  6. Prepare the repair adhesive cloth patch per manufacturer's instructions and apply to the affected area.
    - Immediately position the plastic repair material patch to form the tab shape.
  7. Allow appropriate cure time and shape the repair tab using a small angle sander. Use extreme care to not sand through the exterior surface.
  8. Carry out any required paint repair operations to the bumper cover using Ford-approved paint systems.
  9. Reassemble and install the bumper cover. For additional information, refer to Section 501-19.
-

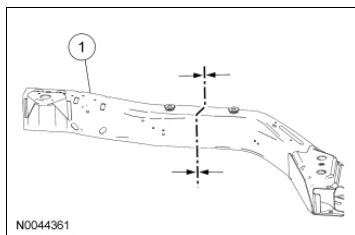
**Frame Members**

## General Equipment

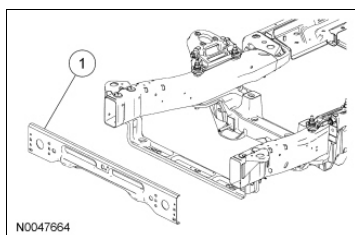
3 Phase Inverter Spot Welder 254-00002
Compuspot 700F Welder 190-50080
I4 Inverter Spot Welder 254-00014
Inverter Welder with MIG Welder 254-00015
Weld Wire ER70S-3 or equivalent 0.9-1.1 mm (0.035-0.045 in)

## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Premium Undercoating ValuGard™ VG101, VG101A (aerosol)	-
Rust Inhibitor ValuGard™ VG104, VG104A (aerosol)	-

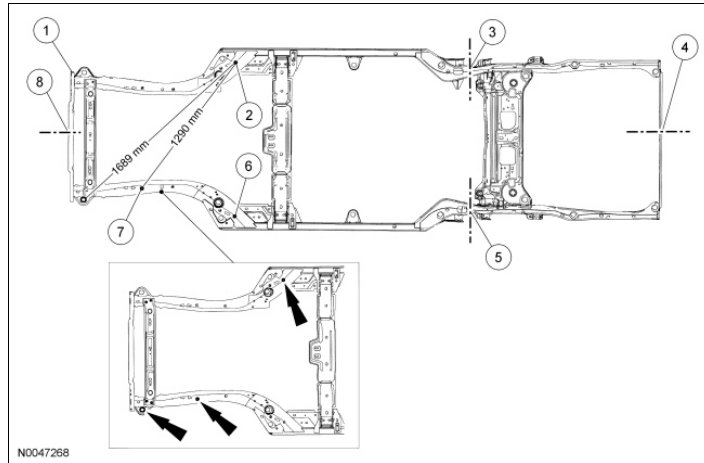
**Front Frame Rail Service Kit**

Item	Part Number	Description
1	5D059 LH/ 5D058 RH	Frame rail replacement kit

**Frame Front Crossmember**

Item	Part Number	Description
1	5020	Frame crossmember

**NOTE:** Viewed from bottom.



Item	Description
1	No. 1 crossmember
2	Master locator hole A1
3	Master locator hole A3 (located on side)
4	Master locator hole C
5	Master locator hole A4 (located on side)
6	Master locator hole A2
7	No. 2 crossmember front mounting hole
8	Master locator hole B

**⚠ WARNING:** Collision damage repair must conform to the instructions contained in this workshop manual. Replacement components must be new, genuine Ford Motor Company parts. Recycled, salvaged, aftermarket or reconditioned parts (including body parts, wheels or safety restraint components) are not authorized by Ford.

Departure from the instructions provided in this manual, including alternate repair methods or the use of substitute components, risks compromising crash safety. Failure to follow these instructions may adversely affect structural integrity and crash safety performance, which could result in serious personal injury to vehicle occupants in a crash.

**⚠ WARNING:** Invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal

injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** The following applies only to non-fire suppression equipped vehicles. Fire suppression equipped vehicles require the entire frame be replaced. Failure to follow this direction will compromise system operation.

**NOTICE:** The following steps provide the procedure for replacing the front frame rails. The frame is designed with energy absorbing convolutions in the front frame rails to absorb crash energy. This convolute section of the frame **MUST NOT** be straightened if the convoluted surfaces show evidence of collapse or buckling. Additionally, if any evidence of damage exists behind the No. 2 crossmember (buckling, cracking), then the entire frame must be replaced.

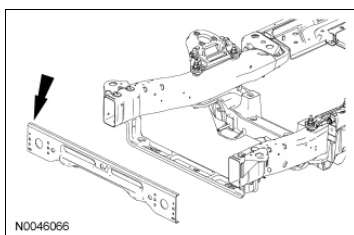
**NOTE:** Corrosion protection needs to be restored whenever it is necessary to sand or grind through painted surfaces or E-coat, or when bare metal repairs are made. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.

**NOTE:** The replacement front rail will be cut and welded to the existing frame using a sleeved butt joint. The sleeve will be made from the unused portion of the service replacement rails.

1. **NOTE:** All body alignment measurements are carried out with the vehicle trim removed. Measurements are made metal to metal, on center unless otherwise specified.

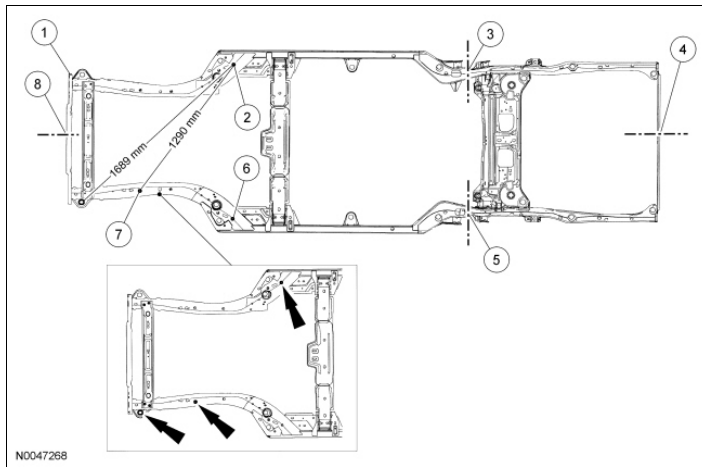
Measure the vehicle to determine if the body requires straightening and alignment. For body dimensional information, refer to Body in this section.

- Anchor the vehicle to a frame rack following the manufacturer's instructions.
2. Remove the front bumper. For additional information, refer to Section 501-19.
  3. Remove the radiator. For additional information, refer to Section 303-03.
    - Drill out spot welds that attach the radiator support, as required, and remove the radiator support.
  4. Remove the engine. For additional information, refer to Section 303-01.
  5. Remove the suspension components. For additional information, refer to Section 204-01.
  6. Using a plasma cutter, reciprocating saw or cut-off wheel, remove the No. 1 crossmember as necessary.



7. Remove the No. 2 crossmember.

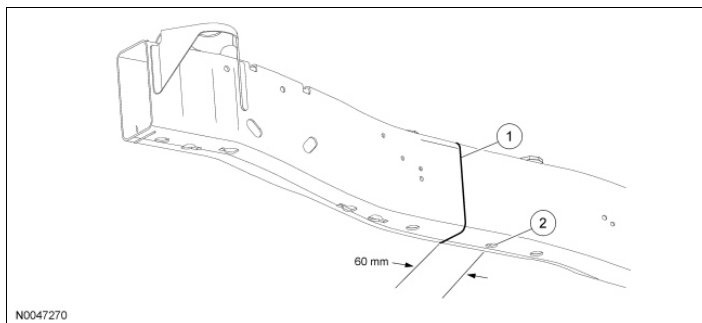
8. Measure in a straight line the diagonal distance from the center of master locator hole A1 (2), to the No. 2 crossmember front mounting hole (7), and record. Repeat for master locator hole A2 (6), to the No. 2 crossmember front mounting hole on the opposite side. The difference in these distances must not exceed 6 mm (0.23 in). If the difference is greater than 6 mm (0.23 in), the entire frame must be replaced.



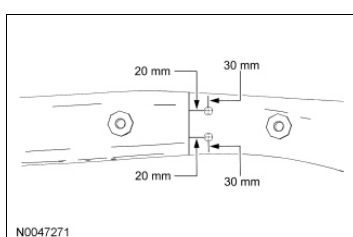
9. **NOTE:** Observe prescribed welding procedures when carrying out frame rail service kit replacement. For additional information, refer to Welding Precautions - Steel in this section.

Using a plasma cutter, reciprocating saw or cut-off wheel, cut off the damaged front rail section at cut line (1). Do not cut directly along the scribed line. Leave enough material on the front side of the scribe line to allow the edge to be ground exactly to the line. This is necessary to make sure of correct fit up between the frame and replacement rail section.

1. Scribe a vertical cut line 60 mm (2.36 in) in front of the No. 2 crossmember locating hole.
2. No. 2 crossmember locating hole.

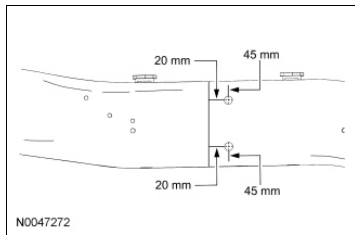


10. Grind off the excess damaged frame in front of the scribed line on the existing rails.
  - Grind a 45 degree bevel along the edge of the existing rail.
11. Drill four 10 mm (0.39 in) holes in the damaged frame, top and bottom surfaces, to aid future plug welding of the inner reinforcement sleeve. Hole locations are 20 mm (0.78 in) to the rear of the cut line and 30 mm (1.18 in) from the edge of the frame rail.





12. Drill four 10 mm (0.39 in) holes in the damaged frame, inner and outer surfaces, to aid plug welding of the inner reinforcement sleeve. Hole locations are 20 mm (0.78 in) to the rear of the cut line and 45 mm (1.77 in) from the top and bottom surfaces.

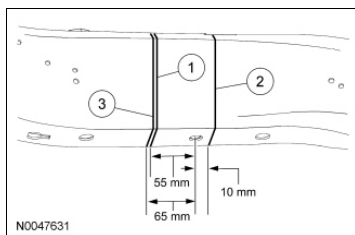


13. Remove the E-coat from the edges, including around the holes to be welded, by grinding or sanding the frame until bare metal is visible.

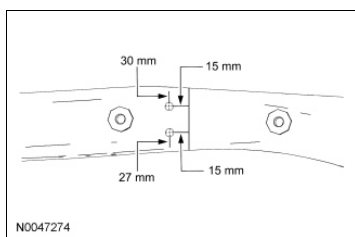
- Wire brush any foreign material from the frame edges within 15 mm (0.59 in) of the repair joint.

14. To prepare for installation, the service part rail will be cut between cut lines 1 and 3. Scribe cut lines 1, 2 and 3 (cut line 2 will be used later in the procedure to make the reinforcement sleeve).

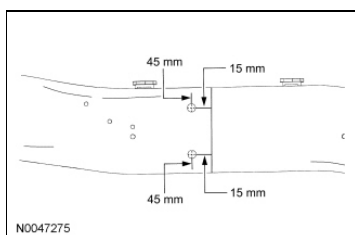
1. Cut line 1 is 55 mm (2.16 in) in front of the center of the No. 2 crossmember locating hole.
2. Cut line 2 is 10 mm (0.39 in) rearward of the No. 2 crossmember locating hole.
3. Cut line 3 is 65 mm (2.55 in) in front of the center of the No. 2 crossmember locating hole.



15. Drill four 10 mm (0.39 in) holes in the service replacement frame, top and bottom surfaces, to aid future plug welding of the inner reinforcement sleeve. Hole locations are 15 mm (0.59 in) forward of cut line 3 (previously scribed), and 27 mm (1.06 in) and 30 mm (1.18 in) from the edge of the frame rail.

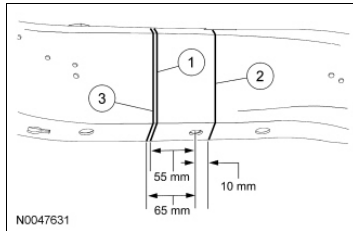


16. Drill four 10 mm (0.39 in) holes in the service replacement frame, inner and outer surfaces, to aid future plug welding of the inner reinforcement sleeve. Hole locations are 15 mm (0.59 in) forward of cut line 3, and 45 mm (1.77 in) from the top and bottom surfaces.



17. Using a reciprocating saw, plasma cutter or cut-off wheel, cut the service part rail at cut line 3. Do not cut directly along the scribe line: cut between lines 1 and 3 leaving enough material on the rear side of line 3 to allow the edge to be ground exactly to the line. This is necessary to make sure of correct fit up between the frame and the replacement rail section.

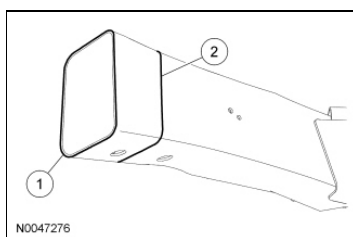
1. Cut line 1 is 55 mm (2.16 in) in front of the center of the No. 2 crossmember locating hole.
2. Cut line 2 is 10 mm (0.39 in) rearward of the No. 2 crossmember locating hole.
3. Cut line 3 is 65 mm (2.55 in) in front of the center of the No. 2 crossmember locating hole.



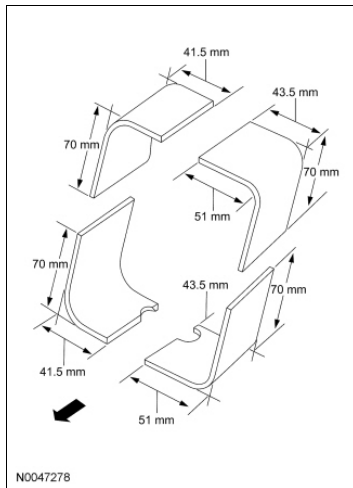
18. Grind off the excess frame material to the rear of cut line 3 on the service part rail.
19. Grind a 45 degree bevel along the edge of the service part rail.
20. Remove the E-coat from the edges, including around the holes to be welded, by grinding or sanding the frame until bare metal is visible.
- Wire brush any foreign material from the frame edges within 15 mm (0.59 in) of the repair joint.
21. **NOTE:** Make note of the orientation of the sleeve (front and top) for future reference to the sleeve.

Fabricate a reinforcement sleeve from the leftover portion of the service part. Make a cut just to the rear of cut line 2. This produces a sleeve that is 70 mm (2.75 in) to 75 mm (2.95 in) long, depending on the exact location of the cut made between cut lines 1 and 3.

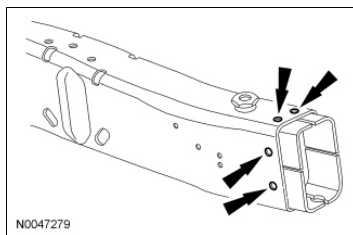
1. Cut line 1 is 55 mm (2.16 in) from the center of No. 2 crossmember locating hole.
2. Cut line 2 is 10 mm (0.39 in) rearward of the No. 2 crossmember locating hole. Make the cut just to the rear of the cut line.



22. Scribe 4 marks onto each face of the sleeve to aid in drawing scribe lines.
- On the sleeves outside face, measure and scribe a mark 70 mm (2.75 in) up from the bottom surface along both front and rear edges, and 70 mm (2.75 in) down from the top along both front and rear edges. Repeat for the sleeves inside face.
  - On the sleeves top face measure and scribe a mark 41.5 mm (1.63 in) out from the inside surface along both front and rear edges, 51 mm (2 in) in from the outside surface along the front edge, and 43.5 mm (1.71 in) in from the outside surface along the rear edge.

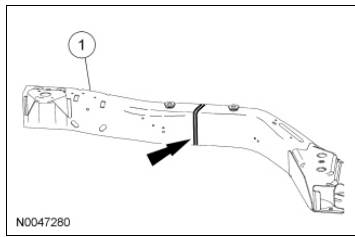


23. Connect the scribed marks to form 8 straight lines. Cut the sleeve into 4 L-shaped pieces, checking that the 4 pieces fit inside the existing frame.
24. Install the 4 pieces one at a time into the service replacement rail only. Trim the parts as needed for a flush fit against the inside surface of the rail. If installed on the existing frame first, the geometry of the frame may not allow the service replacement rail to slide over the sleeve.
25. Plug weld the sleeves into place through the 8 holes drilled previously.
  - When the sleeves are in place, check the fit and alignment of the service part rail. Insert and support the rail and the sleeve into the vehicle, leaving a 5 mm (0.19 in) gap at the butt joint when measuring the alignment.



26. Check that the No. 2 crossmember aligns with the mounting holes on the frame rails.
27. Check the position of the front body mount on both the left and right hand rails. Measure the diagonal distance from master locator hole A1 to the front body mount and record it. Repeat for master locator hole A2. This distance should be 1,689 mm (66.49 in). The difference between the 2 measurements should not exceed 6 mm (0.23 in).
  - If the measurements exceed 6 mm (0.23 in), adjust the frame rail until the No. 2 crossmember mounts correctly and the difference between the diagonal measurements is less than 6 mm (0.23 in).
28. Prepare all bare metal surfaces with metal surface prep. Apply weld-through primer to the immediate heat affected zone of the weld area.
29. Maintaining the 5 mm (0.19 in) gap at the butt joint, plug weld the replacement rail to the existing frame at the eight 10 mm (0.39 in) holes. Recheck the alignment of the frame and adjust as necessary.
30. Stitch-weld along the section joint using a Metal Inert Gas (MIG) welder with 0.9-1.1 mm (0.035-0.045 in) AWS ER70S-3 wire. Make 50 mm (1.96 in) welds on all 4 sides of the rail. Support the service replacement rail (1), and repeat the step to check the alignment of the rail.

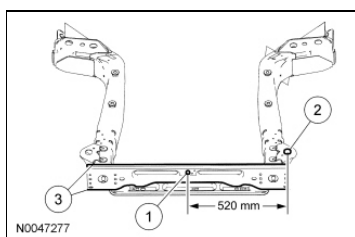
- Complete the stitch-weld along the entire section joint. This will create a solid joint with minimal heat distortion.



31. Dress all welds as necessary.
32. Use a dye penetrant to determine if any cracks or large voids exist in the weld joint. If cracks or other defects exist, grind out the defect and repair until the weld is free of defects.
  - Clean the repair area with metal surface prep and apply corrosion protection to the inside and outside of the frame.
33. Install the No. 1 crossmember.
  - Remove the E-coat from the mating surfaces to be welded, 15 mm (0.59 in) from the edges or holes by grinding or sanding until bare metal is visible.
34. **NOTE:** Prepare all bare metal surfaces with metal surface cleaner. Apply weld-through primer to the immediate heat affected zone of the weld area.

Install the No. 1 crossmember.

1. Align the No. 1 crossmember on the frame rails. Using the master locator hole in the center of the crossmember for reference.
2. The distance between the left and right front body mount to the master locator hole is 520 mm (20.47 in) 3 mm (0.11 in).
3. Using a MIG welder, stitch-weld along the top and bottom 55 mm (2.16 in), where the No. 1 crossmember C-section meets the frame's top and bottom surface. Use 9 mm (0.35 in) AWS ER70S-3 wire.




35. Dress all welds as necessary.
36. Use a dye penetrant to determine if any cracks or large voids exist in the weld joint. If cracks or other defects exist, grind out the defect and repair until the weld is free of defects.
  - Clean the repair area with metal surface cleaner and apply anti-corrosion coating to the bare metal areas.
37. Reinstall components removed during disassembly, making sure to tighten all fasteners to correct specification.
38. If equipped with an air suspension system, activate the power supply. This can be accomplished by reconnecting the battery or turning on the air suspension service switch located in the luggage

compartment LH side.

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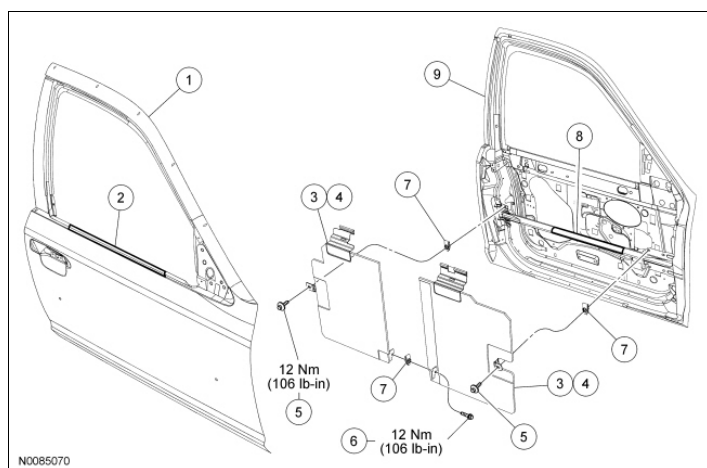
**Ballistic Door Panel**

## Special Tool(s)

	<b>Heavy Duty Riveter</b> 501-D011 (D80L-23200-A) or equivalent
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**Ballistic Door Panel Insert**

**NOTE:** Some Crown Victoria police package vehicles come equipped with a ballistic front door panel insert. The ballistic door panel is a 2-piece assembly. These panels are a set and cannot be serviced individually.

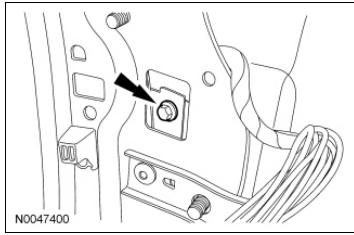


Item	Part Number	Description
1	420221 LH/ 420220 RH	Front door outer panel
2	143580	Protective film
3	201B69	Ballistic door panel kit (driver side)
4	201B68	Ballistic door panel kit (passenger side)
5	W712308-S439	Bolts (2 required)
6	W500214	Bolt
7	N806886	J-clips (3 required)
8	600562	Foam tape (dual layer)
9	5420125 LH/ 5420124 RH	Front door shell

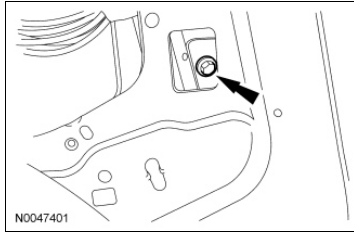
**Removal**

1. Remove the front door glass top run. For additional information, refer to [Section 501-11](#) .
2. Remove the front door window regulator and motor. For additional information, refer to [Section 501-11](#) .
3. Remove the front door latch. For additional information, refer to [Section 501-14](#) .

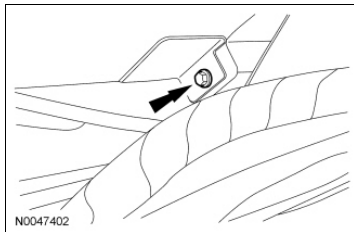
4. Remove the bolt on the forward ballistic door panel.



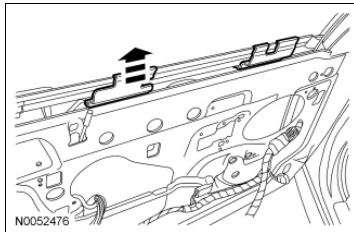
5. Remove the bolt on the rearward ballistic door panel.



6. Remove the center bolt of the ballistic door panel.



7. Slide the forward ballistic door panel as far to the front as possible and remove the rearward panel.



8. Remove the forward ballistic door panel.

## Installation

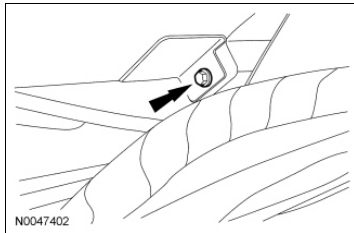
1. **NOTE:** If installing ballistic door panels in a new door or on a vehicle which has received a new front door outer panel, make sure to first install the protective film. If only reinstalling the ballistic door panels, proceed to Step 4.

Install protective film to the front door outer panel belt line, position to the bottom of the belt line flange.

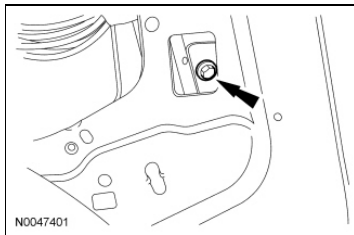
2. **NOTE:** If installing ballistic door panels in a new door, make sure to first install the foam tape to the intrusion beam to prevent panel rattle. If only reinstalling the ballistic door panels, proceed to Step 4.

Apply a double-layer of the foam tape to the intrusion beam.

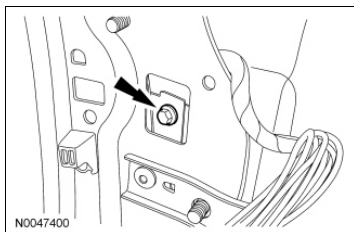
3. Install the J-clips.
4. Insert the forward ballistic door panel through the window opening and hook the top bracket over the outer belt line sheet metal.
  - Position as far forward as possible.
5. Insert the rearward ballistic door panel through the window opening and hook the top bracket over the outer belt line sheet metal.
  - Slide the forward panel back until mated with the rearward panel.
6. Align the panels so the ceramic plate bottoms out against the adjacent panel.
7. Install the bolt in the lower L-bracket.
  - Tighten to 12 Nm (106 lb-in).



8. Install the bolt in the rearward intrusion beam bracket J-clip, but do not tighten.



9. Install the bolt in the forward intrusion beam bracket J-clip, but do not tighten.



10. Visually inspect to make sure there is no gap between the panels. Adjust as necessary.
11. Tighten the rear bolt to 12 Nm (106 lb-in).
12. Tighten the forward bolt to 12 Nm (106 lb-in).
13. Install the front door latch. For additional information, refer to [Section 501-14](#) .
14. Install the front door window regulator and motor. For additional information, refer to [Section 501-11](#) .
15. Install the front door glass top run. For additional information, refer to [Section 501-11](#) .



16. Apply the BALLISTIC PANEL label to the door trim panel just forward of the door latch handle.
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**Inner Body Reinforcing Panels****General Equipment**

3 Phase Inverter Spot Welder 254-00002
Compuspot 700F Welder 190-50080
I4 Inverter Spot Welder 254-00014
Inverter Welder with MIG Welder 254-00015

**Material**

Item	Specification
Rust Inhibitor ValuGard™ VG104, VG104A (aerosol)	-
Premium Undercoating ValuGard™ VG101, VG101A (aerosol)	-
Seam Sealer TA-2	-

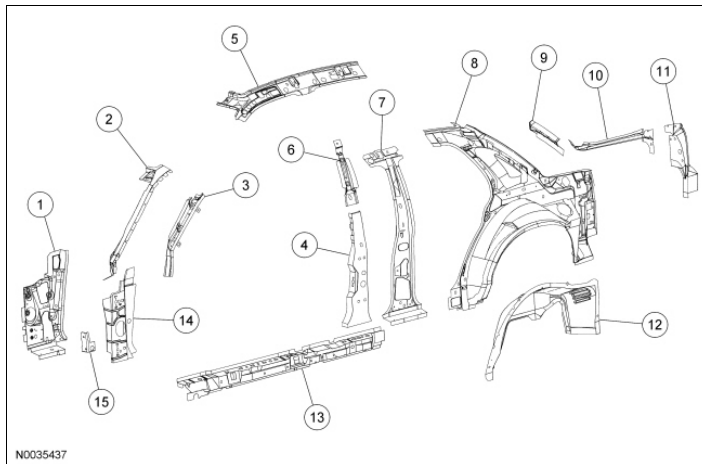
**Standard Wheelbase**

**NOTICE:** Sectioning procedures can only be carried out on the outer body side panel. No sectioning repairs can be carried out on inner reinforcement panels. Failure to follow these instructions may compromise the structural integrity of the vehicle

**NOTE:** Refer to the Ford Recommended Steel Repairability Matrix in the Specifications portion of this section for specific information regarding steel descriptions.

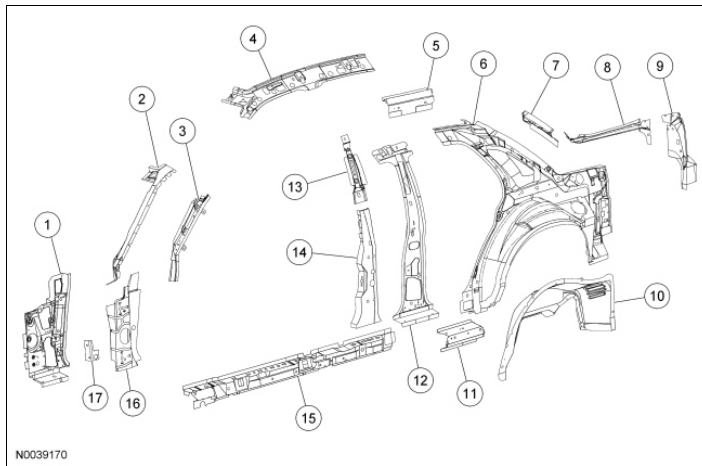
**NOTE:** Outer panels removed for clarity.

**NOTE:** Left side shown, right side similar.



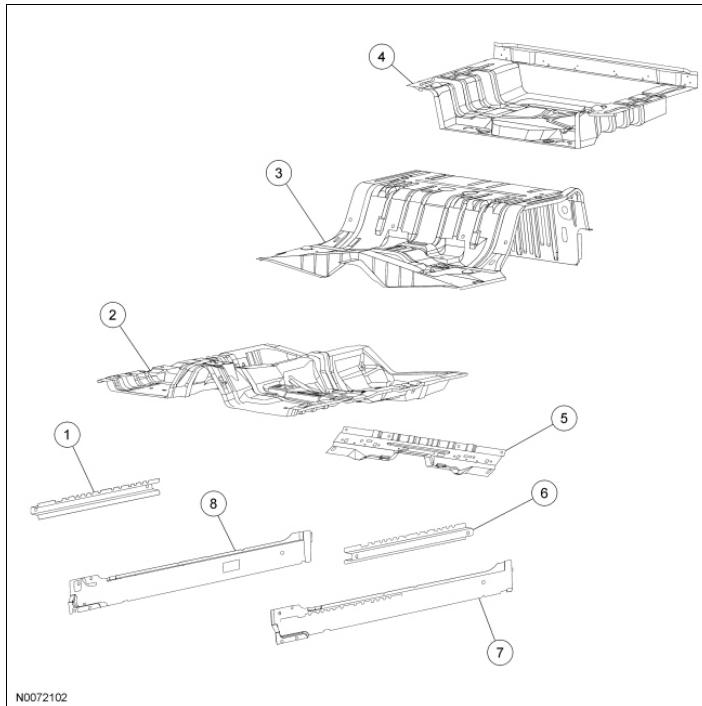
Item	Part Number	Description
1	02039 LH/ 02038 RH	Cowl side panel high-strength steel
2	02509 LH/ 02508 RH	Front body pillar high-strength steel
3	02505 LH/ 02504 RH	Front body upper pillar mild steel
4	24301 LH/ 24300 RH	Center body pillar high-strength steel
5	51181 LH/ 51180 RH	Roof side inner rail high-strength steel
6		Front seat shoulder strap reinforcement (LH/RH) high-strength steel (part of 24301/24300)
7	24301 LH/ 24300 RH	Center body pillar serviced as assembly with No. 4 high-strength steel
8	27791 LH/ 27790 RH	Quarter panel inner high-strength steel
9	602A11	Rear seat shoulder strap reinforcement high-strength steel
10	278B11 LH/ 278B10 RH	Quarter panel extension mild steel
11	45115 LH/ 45114 RH	Luggage compartment drain trough mild steel
12	27887 LH/ 27886 RH	Quarter panel inner wheelhouse mild steel
13	20403 LH/ 20402 RH	Door frame opening reinforcement high-strength steel
14	22843 LH/ 22842 RH	Front door hinge reinforcement high-strength steel
15	204A07 LH/ 204A06 RH	Door frame reinforcement high-strength steel

### Long Wheelbase



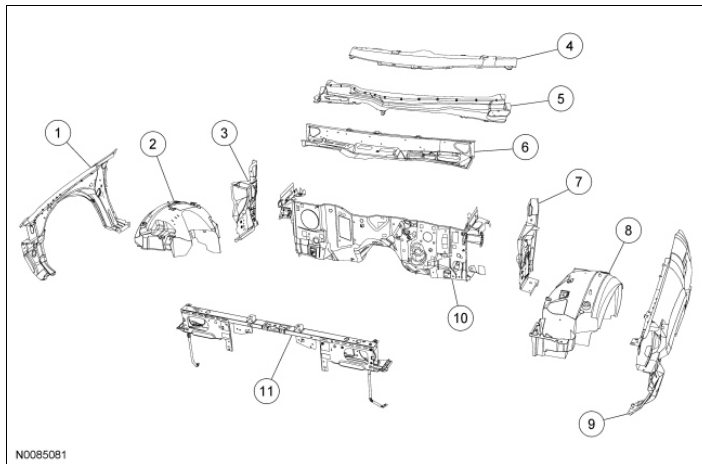
Item	Part Number	Description
1	02039 LH/ 02038 RH	Cowl side panel high-strength steel
2	02509 LH/ 02508 RH	Front body pillar high-strength steel
3	02505 LH/ 02504 RH	Front body upper pillar mild steel
4	51181 LH/ 51180 RH	Roof side inner rail high-strength steel
5	279C91 LH/ 279C90 RH	Quarter panel upper rear extension mild steel
6	27791 LH/ 27790 RH	Quarter panel inner high-strength steel
7	602A11	Rear seat shoulder strap reinforcement high-strength steel
8	278B11 LH/ 278B10 RH	Quarter panel extension mild steel
9	45115 LH/ 45114 RH	Luggage compartment drain trough mild steel
10	27887 LH/ 27886 RH	Quarter panel inner wheelhouse mild steel
11	279C91 LH/ 279C90 RH	Quarter panel lower rear extension mild steel
12	24301 LH/ 24300 RH	Center body pillar serviced as assembly with No. 14 high-strength steel
13		Front seat shoulder strap reinforcement high-strength steel (part of 24301/24300)
14	24301 LH/ 24300 RH	Center body pillar high-strength steel
15	20403 LH/ 20402 RH	Door frame opening reinforcement high-strength steel
16	22843 LH/ 22842 RH	Front door hinge reinforcement high-strength steel
17	204A07 LH/ 204A06 RH	Door frame reinforcement high-strength steel

## Underbody



Item	Part Number	Description
1	101W24	Floor side member high strength steel
2	11135	Front floor pan assembly mild steel
3	11160	Center floor pan assembly mild steel
4	11215	Rear floor pan assembly mild steel
5	10638	Reinforcement high-strength steel
6	101W25	Floor side member (LH) high-strength steel
7	10117	Floor side inner (LH) mild steel
8	10116	Floor side inner (RH) mild steel

## Front Structure



Item	Part Number	Description
1	16K006	Inner fender assembly mild steel
2	16044	Fender apron plastic
3	02044	Cowl side inner panel mild steel
4	023A62	Windshield wiper mounting panel mild steel
5	02015	Cowl top outer mild steel
6	02030	Cowl top inner panel mild steel
7	02045	Cowl side inner panel mild steel
8	16045	Fender apron plastic
9	16K007	Inner fender assembly mild steel
10	01605	Dash panel laminated sound/vibration steel
11	16138	Radiator support mild steel

**⚠ WARNING:** Collision damage repair must conform to the instructions contained in this workshop manual. Replacement components must be new, genuine Ford Motor Company parts. Recycled, salvaged, aftermarket or reconditioned parts (including body parts, wheels or safety restraint components) are not authorized by Ford.

Departure from the instructions provided in this manual, including alternate repair methods or the use of substitute components, risks compromising crash safety. Failure to follow these instructions may adversely affect structural integrity and crash safety performance, which could result in serious personal injury to vehicle occupants in a crash.

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#). Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Invisible ultraviolet and infrared rays emitted in welding can injure unprotected eyes and skin. Always use protection such as a welder's helmet with dark-colored filter lenses of the correct density. Electric welding will produce intense radiation, therefore, filter plate lenses of the deepest shade providing adequate visibility are recommended. It is strongly recommended that persons working in the weld area wear flash safety goggles. Also wear protective clothing. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always wear protective equipment including eye protection with side shields, and a dust mask when sanding or grinding. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** On vehicles equipped with Safety Canopy® options, prior to carrying out any sectioning repairs near the roof line or sail panel areas of the vehicle, remove the Safety Canopy® module and related components. Failure to comply may result in accidental deployment or damage to the Safety Canopy®. Refer to Section 501-20B . Failure to follow these instructions may result in serious injury to technician or vehicle occupant(s).

**⚠ WARNING:** Do not cut or grind body side components within 50 mm (1.96 in) of restraint anchoring points. Welding within 50 mm (1.96 in) of restraint anchoring points may result in incorrect operation of restraint devices. For additional restraints anchoring location information, refer to Section 501-20A and Section 501-20B . Failure to follow these instructions may result in serious injury to vehicle occupant(s).

**NOTE:** When it is necessary to carry out weld-bonding procedures, refer to Weld-Bonding in this section.

1. Remove the outer body sheet metal from the affected area prior to carrying out any reinforcing panel replacement. For additional information, refer to Sectioning Guidelines in this section.

**NOTE:** Factory spot welds may be substituted with either resistance spot welds or Metal Inert Gas (MIG) plug welds. Spot/plug welds should equal factory welds in both location and quantity. Do not place a new spot weld directly over an original weld location. Plug weld hole should equal 8 mm (0.31 in) diameter.

**NOTE:** Observe prescribed welding procedures when carrying out any body side section repair. For additional information, refer to Welding Precautions - Steel in this section.

2. **NOTE:** When it is necessary to carry out weld-bonding procedures, refer to Weld-Bonding in this section.

Remove the outer body sheet metal from the affected area prior to carrying out any reinforcing panel replacement. For additional information, refer to Sectioning Guidelines in this section.

3. When welding overlapping surfaces or substrates, apply corrosion protection material between the surfaces prior to welding. When the surfaces have been welded, apply corrosion protection material to the exterior surfaces or substrates. For additional information, refer to Restoring Corrosion Protection Following Repair in this section.
  - Make sure horizontal joints and flanges are correctly sealed with seam sealer to prevent moisture intrusion. Water and moisture migrate to horizontal joints and corrosion tends to occur more rapidly in these areas. Metal surfaces must be clean and dry before applying seam sealer.
4. If equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B .
5. If equipped with an air suspension system, reactivate the power supply. This can be accomplished by reconnecting the battery or turning on the air suspension service switch located in the luggage compartment on the LH side.
6. Proceed with the refinish process following Ford-approved paint recommendations.





**Torque Specifications**

Description	Nm	lb-ft	lb-in
Body mount bolts (all others)	48	35	-
Brake caliper bolts	32	24	-
Engine mount nuts	90	66	-
Front end body mount bolts	55	41	-
Intermediate shaft bolt	30	22	-
Lower control arm rear mounting bolts	90	66	-
No. 2 crossmember bolts	250	184	-
No. 2 crossmember bracket bolts	103	76	-
No. 2 crossmember bracket nuts	200	148	-
Outer tie-rod end nuts	80	59	-
Stabilizer bar link nuts	63	46	-
Steering gear nuts	103	76	-
Steering gear studs	20	-	177

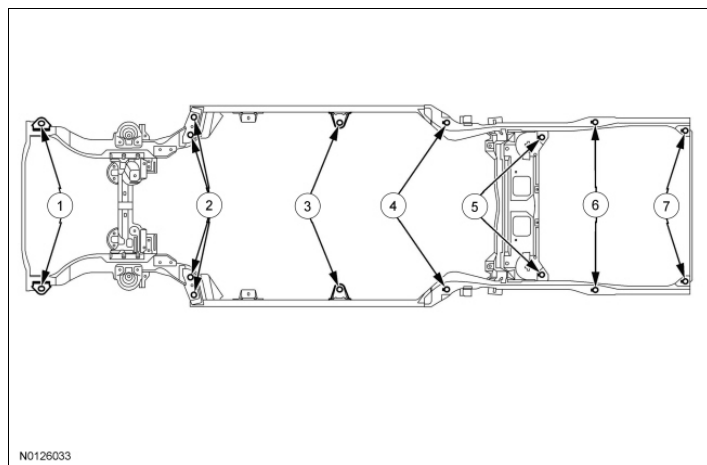
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## SECTION 502-02: Full Frame and Body Mounting

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## DESCRIPTION AND OPERATION

Procedure revision date: 12/02/2010

**Frame and Body Mounting**

Item	Part Number	Description
1	W709224	Front end body mount bolts
1	5400155	Front end body mount (lower)
1	5400396	Front end body mount (upper)
2	5C155	Bolt And Grommet Asy
2	5400396	Body support mount No. 1 (upper)
3	5C155	Bolt And Grommet Asy
3	5400396	Body support mount No. 2 (upper)
4	5C155	Bolt And Grommet Asy
4	5400396	Body support mount No. 3 (upper)
5	5C155	Bolt And Grommet Asy
5	5400396	Body support mount No. 4 (upper)
6	5C155	Bolt And Grommet Asy
6	5400396	Body support mount No. 5 (upper)
7	5C155	Bolt And Grommet Asy
7	5400396	Body support mount No. 6 (upper)

**NOTE:** For torque specifications, refer to the specifications table in this section.

The frame is bolted to the body and is used to:

- aid in structural support.
- provide mounting surfaces for the rear of the front suspension control arms.
- support the radiator.
- provide a mounting point for the front stabilizer bar.
- provide a mounting point for the No. 2 and No. 3 crossmembers.

The front No. 2 crossmember is bolted to the frame and is used to:

- aid in structural support.
- provide mounting surfaces for the front suspension control arms.

- provide a mounting point for the engine mounts.

The No. 3 crossmember is bolted to the frame and is used to:

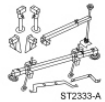

- aid in structural support.
- provide mounting surfaces for the rear transmission support insulator.

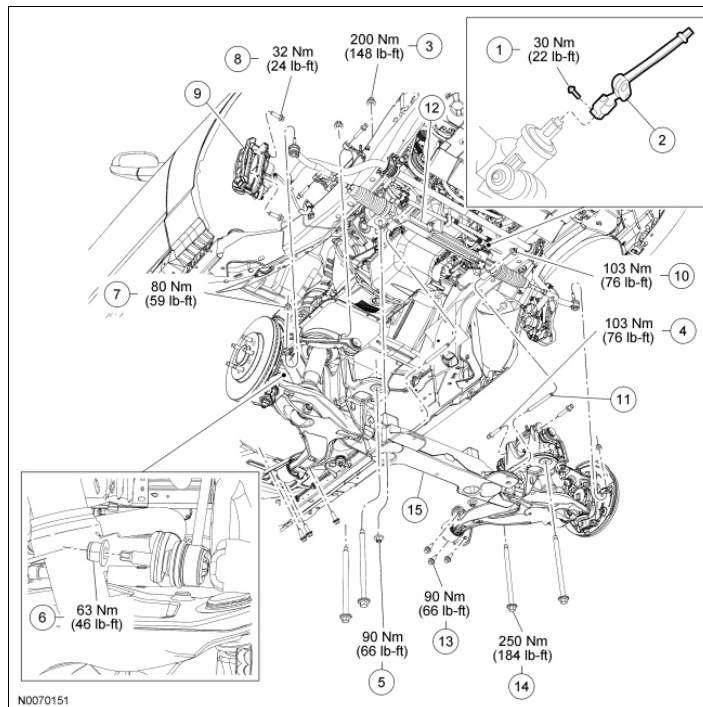
For body misalignment and checking, refer to Section 501-35 . Before welding is carried out on the vehicle, refer to Section 501-35 . For frame repair, refer to Section 501-35 .

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**Crossmember - Number 2**

## Special Tool(s)

	Support Bar, Engine 303-F072
	Support Bar, Engine 303-639



N0070151

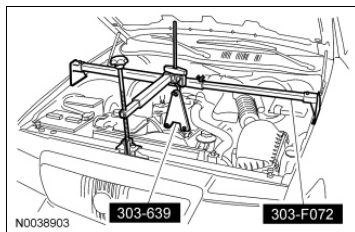
Item	Part Number	Description
1	N808349	Intermediate shaft bolt
2	3B676	Intermediate shaft
3	N804431	Crossmember bracket nut (4 required)
4	W709882	Crossmember bracket bolt (4 required)
5	W707492	Engine mount nut (2 required)
6	W520213	Stabilizer bar link nut (2 required)
7	W520214	Outer tie-rod end nut (2 required)
8	2N386	Brake caliper bolt (4 required)
9	2B120 RH/ 2B121 LH	Brake caliper (2 required)
10	W707492	Steering gear nut (2 required)
11	W707972	Steering gear stud (2 required)

12	3504	Steering gear
13	W708601	Lower control arm rear mounting bolt (6 required)
14	W707968	No. 2 crossmember bolt (4 required)
15	5C145	No. 2 crossmember

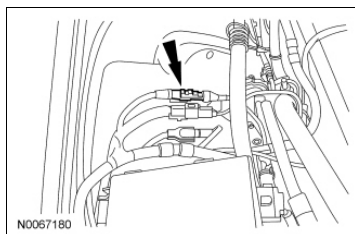
### Removal

**NOTICE:** Suspension fasteners are critical parts because they affect the performance of vital components and systems and their failure can result in major repair expense. A new part with the same part number must be installed if installation is necessary. Do not use a new part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

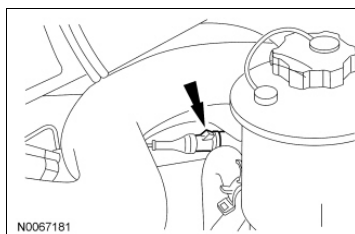
1. Remove the generator. For additional information, refer to Section 414-00 .
2. Remove the 3 pin-type retainers and the radiator sight shield.
3. Install the Engine Support Bars.



4. Disconnect the RH ABS electrical connectors.



5. Disconnect the LH ABS electrical connectors.



6. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

Remove the LH and RH front wheel and tire assemblies. For additional information, refer to [Section 204-04](#).

7. **NOTICE:** Do not allow the intermediate shaft to rotate while it is disconnected from the steering gear or damage to the clockspring may result. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to [Section 501-20B](#).

Remove the bolt and detach the intermediate shaft from the steering gear.

8. Remove the 2 nuts and the 2 bolts from the LH No. 2 crossmember bracket and the 2 nuts and the 2 bolts from the RH No. 2 crossmember bracket.
- Separate the No. 2 crossmember brackets from the crossmember.

9. Raise and support the vehicle.

10. Remove the 2 engine mount nuts.

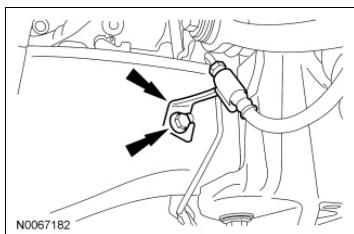
11. **NOTE:** The hex-holding feature can be used to prevent turning of the stud while removing the nut.

Remove the 2 nuts and disconnect the LH and RH stabilizer bar links.

12. **NOTE:** The hex-holding feature can be used to prevent turning of the stud while removing the nut.

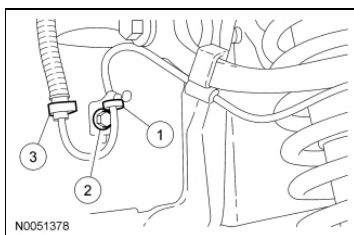
Remove the 2 nuts and disconnect the LH and RH outer tie-rod ends.

13. Remove the 2 bolts and position the LH and RH brake hose and brackets assemblies aside.



14. Remove the 4 bolts and position the LH and RH brake calipers aside.
- Support the brake calipers away from the No. 2 crossmember.

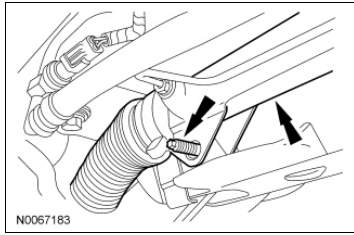
15. Position the front LH and RH ABS harness aside.
1. Release the 2 ABS harnesses from the support bracket.
  2. Remove the 2 bolts and the brackets.
  3. Remove the 2 harness retainers from the frame.



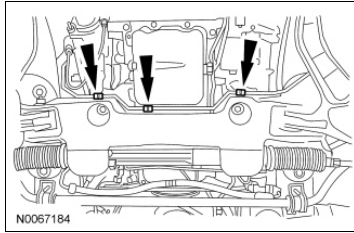
16. Remove the 2 steering gear nuts.

17. Remove the 2 studs and position the steering gear aside.

- Support the steering gear away from the No. 2 crossmember.



18. Release the brake line from the retaining clips at the rear of the No. 2 crossmember.



19. Lower the vehicle.
20. Using the engine support bar, raise the engine to remove the engine weight from the No. 2 crossmember.
21. Raise and support the vehicle.
22. Remove the 3 LH lower control arm and 3 RH lower control arm rear mounting bolts.
23. Position a suitable support table under the No. 2 crossmember.
24. Remove the 4 No. 2 crossmember bolts.
25. Lower and remove the No. 2 crossmember assembly.

## Installation

1. **NOTE:** Position the sway bar and the rear bushing plates into place as the No. 2 crossmember is being raised.

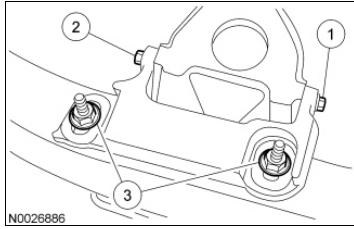
Raise and position the No. 2 crossmember assembly.

2. Install the 4 No. 2 crossmember bolts.
  - Tighten to 250 Nm (184 lb-ft).
3. Position the LH and RH No. 2 crossmember brackets.
4. Remove the support table.
5. **NOTICE:** The bolts must be tightened in the sequence shown or damage to the crossmember bracket may occur.

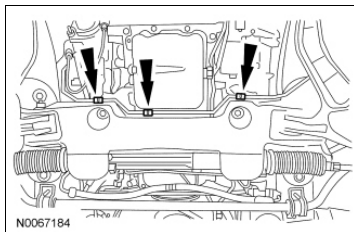
Install the LH and RH No. 2 crossmember bracket nuts and bolts.

1. Tighten the rear bolt.

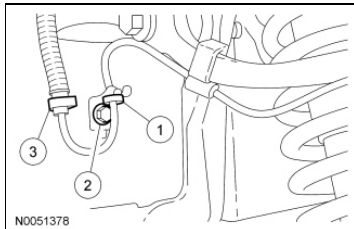
- ◆ Tighten to 103 Nm (76 lb-ft).
- 2. Tighten the front bolt.
  - ◆ Tighten to 103 Nm (76 lb-ft).
- 3. Tighten the nuts.
  - ◆ Tighten to 200 Nm (148 lb-ft).



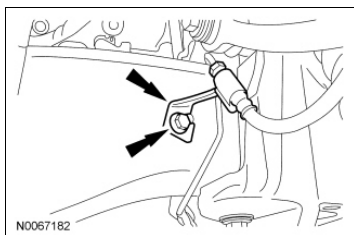
- 6. Install the 3 LH lower control arm and 3 RH lower control arm rear mounting bolts.
  - Tighten to 90 Nm (66 lb-ft).
- 7. Position the brake line into the retaining clips at the rear of the No. 2 crossmember.



- 8. Install the LH and RH ABS harness.
  - 1. Install the 2 harness retainers into the frame.
  - 2. Install the 2 brackets and bolts.
  - 3. Install the 2 ABS harnesses into the support brackets.

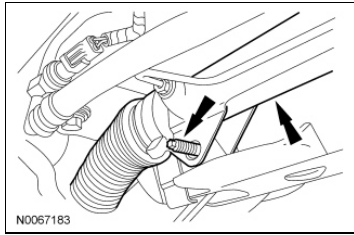


- 9. Position the LH and RH brake calipers and install the 4 bolts.
  - Tighten to 32 Nm (24 lb-ft).
- 10. Position the LH and RH brake hose and brackets and install the 2 bolts.



- 11. Position the steering gear and install the 2 steering gear studs.
  - Tighten to 20 Nm (177 lb-in).





12. Install the 2 steering gear nuts.
  - Tighten to 103 Nm (76 lb-ft).

13. **NOTE:** The hex-holding feature can be used to prevent turning of the stud while installing the nut.

Position the LH and RH stabilizer bar links and install the 2 nuts.

- Install new nuts.
- Tighten to 63 Nm (46 lb-ft).

14. **NOTE:** The hex-holding feature can be used to prevent turning of the stud while installing the nut.

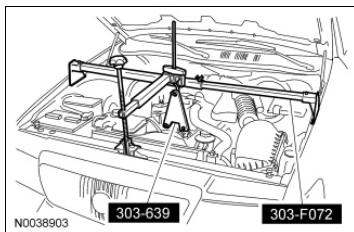
Position the LH and RH tie-rod ends and install the 2 nuts.

- Install new nuts.
- Tighten to 80 Nm (59 lb-ft).

15. Lower the vehicle.

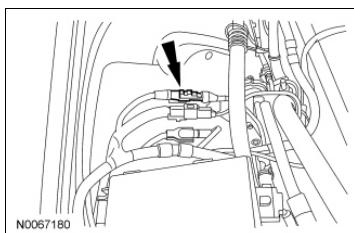
16. Connect the intermediate shaft to the steering gear and install the bolt.
  - Tighten to 30 Nm (22 lb-ft).

17. Remove the Engine Support Bars.

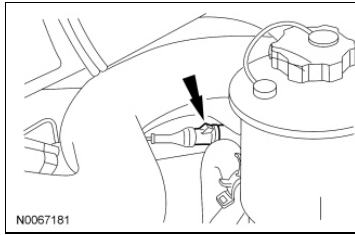


18. Install the LH and RH front wheel and tire assemblies. For additional information, refer to [Section 204-04](#).

19. Connect the RH ABS electrical connectors.



20. Connect the LH ABS electrical connectors.



21. Install the generator. For additional information, refer to Section 414-00 .
  22. Position the radiator sight shield and install the 3 pin-type retainers.
  23. Raise and support the vehicle.
  24. Install the 2 engine mount nuts.
    - Tighten to 90 Nm (66 lb-ft).
  25. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**
  26. Check the front end alignment and adjust as necessary. For additional information, refer to Section 204-00 .
-

## Material

Item	Specification	Fill Capacity
Dye-Lite® Gasoline Engine Oil Leak Detection Dye 164-R3700 (Rotunda)	-	29.6 ml (1 oz)
High Temperature Retaining Compound Loctite® 620TM/Permatex® 62050, or equivalent; obtain locally	WSK-M2G349-A9	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A	-
Threadlock 262 TA-26	WSK-M2G351-A6	-

## Engine

**NOTICE:** When repairing engines, all parts must be contamination free. If contamination/foreign material is present when repairing an engine, premature engine failure may occur.

**NOTE:** Specifications show the expected minimum or maximum condition. Refer to the appropriate section in Group 303 for the procedure.

**NOTE:** If a component fails to meet the specifications, it is necessary to refinish it or install a new component. Wear limits are provided as an aid to determine if the component can be refinished. A new component must be installed when any component fails to meet specifications and cannot be refinished.

**NOTE:** This section contains information, steps and procedures that may not be specific to this engine.

This section covers general procedures and diagnosis and testing of the engine system, except for exhaust emission control devices, which are covered in the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

The engine incorporates the following features: Refer to the appropriate section in Group 303 for the procedure.

- Crankcase ventilation or breather system
- Exhaust emission control system
- Evaporative Emission (EVAP) control system

Some engines incorporate a fail-safe cooling system. Refer to the appropriate section in Group 303 for the procedure.

The engine, fuel system, ignition system, emissions system and exhaust system all affect exhaust emission levels and must be maintained according to the maintenance schedule. Refer to the scheduled Maintenance Guide.

Correct engine identification is required to order parts. Refer to the appropriate section in Group 303 for the procedure.





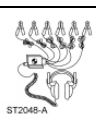




For complete vehicle and engine identification codes, refer to Section 100-01 .

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**Engine**

## Special Tool(s)

 ST1300-A	12 Volt Master UV Diagnostic Inspection Kit 164-R0756 or equivalent (Leak Detector)
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
 ST1298-A	Engine Cylinder Leak Detection/Air Pressurization Kit 014-00708 or equivalent
 ST2312-A	EngineEAR 107-R2100 or equivalent
 ST2048-A	EngineEAR/ChassisEAR 107-R2102 or equivalent
 ST1296-A	Oil Pressure Gauge 303-088 (T73L-6600-A)
 ST1299-A	Quick Disconnect Compression Tester 134-R0212 or equivalent
 ST1297-A	Vacuum/Pressure Tester 164-R0253 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

## Material

Item	Specification
Dye-Lite® Gasoline Engine Oil Leak Detection Dye 164-R3700 (Rotunda)	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

**⚠ WARNING: If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

There are 2 diagnostic paths that can be followed depending on the type of engine concern. Carry out either the Inspection and Verification - Engine Performance or Inspection and Verification - NVH.

### Inspection and Verification - Engine Performance

1. Verify the customer concern by operating the engine to duplicate the condition.
2. Visually inspect for obvious signs of mechanical damage. Refer to the following chart.

#### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• Engine coolant leaks</li> <li>• Engine oil leaks</li> <li>• Fuel leaks</li> <li>• Damaged or severely worn parts</li> <li>• Loose mounting bolts, studs and nuts</li> </ul>

3. If the inspection reveals obvious concerns that can be readily identified, repair as necessary.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:
  - verify the ignition key is in the ON position.
  - verify the scan tool operation with a known good vehicle.
  - refer to Section 418-00 to diagnose no response from the PCM.
7. Carry out the network test.
  - If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
  - If the network test passes, retrieve and record continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the PCM.

9. If the DTCs retrieved are related to the concern, refer to Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart - Engine Performance .

### Inspection and Verification - NVH

1. NVH symptoms should be identified using the diagnostic tools and techniques that are available. For a list of these techniques, tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 .
2. Verify the customer concern by operating the engine to duplicate the condition.
3. Check the engine oil level and check the oil for contamination. Low engine oil level or contaminated oil are a common cause of engine noise. If the oil is contaminated, the source of the contamination must be identified and repaired as necessary.
4. Visually inspect for obvious signs of mechanical damage. Refer to the following chart.

#### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• Loose mounting bolts, studs and nuts</li> <li>• Damaged or leaking powertrain mounts</li> <li>• Damaged or disconnected vacuum hoses</li> <li>• Obstruction of cooling fan</li> <li>• Obstruction of Front End Accessory Drive (FEAD)</li> <li>• Damaged or disconnected air intake components</li> </ul>

5. If the inspection reveals obvious concerns that can be readily identified, repair as necessary.
6. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

7. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
  - check the scan tool connection to the VCM .
  - refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.
8. If the scan tool does not communicate with the vehicle:
    - verify the ignition key is in the ON position.
    - verify the scan tool operation with a known good vehicle.
    - refer to Section 418-00 to diagnose no response from the PCM.
  9. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .



- If the network test passes, retrieve and record continuous memory DTCs.
10. Clear the continuous DTCs and carry out the self-test diagnostics for the PCM.
  11. If the DTCs retrieved are related to the concern, refer to Section 419-10.
  12. If no DTCs related to the concern are retrieved, continue the inspection and verification if a noise concern is related to the engine. For vibration concerns and noise concerns such as powertrain mounts, air intake system and starter, GO to Symptom Chart - NVH.

In some cases, a noise may be a normal characteristic of that engine type. In other cases the noise may require further investigation. Comparing the noise to a similar year/model vehicle equipped with the same engine will aid in determining if the noise is normal or abnormal.

Once a customer concern has been identified as an abnormal engine noise, it is critical to determine the location of the specific noise. Use the EngineEAR/ChassisEAR or stethoscope (the noise will always be louder closer to the noise source) to isolate the location of the noise to one of the following areas.

- Fuel injector(s)
- Upper end of engine
- Lower end of engine
- Front of engine
- Rear of engine

#### **Fuel injector noise**

A common source of an engine ticking noise can be related to the fuel injector(s). This is normal engine noise that can be verified by listening to another vehicle. If the injector noise is excessive or irregular, use the EngineEAR/ChassisEAR or stethoscope to isolate the noise to a specific fuel injector.

#### **Upper end engine noise**

A common source of upper end engine noise (ticking, knocking or rattle) include the camshaft(s) and valve train. Upper end engine noise can be determined using the EngineEAR/ChassisEAR or stethoscope on the valve cover bolts. If the noise is loudest from the valve cover bolts, then the noise is upper end. The EngineEAR/ChassisEAR or stethoscope can be used to further isolate the noise to the specific cylinder bank and cylinder. Removal of the valve covers will be required to pinpoint the source of the noise.

#### **Lower end engine noise**

A common source of lower end engine noise (ticking or knocking) include the crankshaft, connecting rod(s) and bearings. Lower end noises can be determined by using the oil pan or cylinder block lug bosses. If the noise is loudest from these areas, then the noise is lower end. If an engine noise is isolated to the lower end, some disassembly of the engine may be required to inspect for damage or wear.

#### **Front of engine noise**

A common source of noise from the front of the engine (squeal, chirp, whine or hoot) is the Front End Accessory Drive (FEAD) components. To isolate FEAD noise, carry out the Engine Accessory Test, refer to Section 100-04.

Some other noises from the front of the engine (ticking, tapping or rattle) may be internal to the engine. Use the EngineEAR/ChassisEAR or stethoscope on the engine front cover to determine if the noise is internal to the engine. Removal of the engine front cover may be necessary to inspect internal engine components.

## Rear of engine noise

A common source of noise from the rear of the engine (knocking) is the flexplate. Inspection of the flexplate will be necessary.

Some engines have timing drive components at the rear of the engine and may be the source of noise (ticking, knocking or rattle). Use the EngineEAR/ChassisEAR or stethoscope on the rear of the engine if you suspect the noise is internal to the engine. Some disassembly of the engine may be required to inspect for damage or wear.

13. After you have localized the noise, note the characteristics of the noise, including type of noise, frequency and conditions when the noise occurs and GO to Symptom Chart - NVH .

## Symptom Chart - Engine Performance

Symptom Chart - Engine Performance

## Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible that any one of multiple systems may be the cause of the symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

### ConditionPossible SourcesAction

- Drone type noise
- Powertrain mount(s)
- CARRY OUT the Powertrain/Drivetrain Mount Neutralizing procedure in this section. TEST the system for normal operation after the repair.
- Drumming noise - occurs inside the vehicle during idle or high idle, hot or cold. Very low-frequency drumming is very rpm dependent
- Engine vibration excites the body resonances inducing interior noise
- CARRY OUT the Powertrain/Drivetrain Mount Neutralizing procedure in this section. TEST the system for normal operation after the repair.
- Engine drumming noise - accompanied by vibration
- Powertrain mount(s)
- CARRY OUT the Powertrain/Drivetrain Mount Neutralizing procedure in this section. TEST the system for normal operation after the repair.

- Rattle - occurs at idle or at light acceleration from a stop
- Powertrain mount(s)
- CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, REFER to Section 303-01 . For transmission, REFER to Section 307-01 . TEST the system for normal operation after the repair.
- Whine/moan type noise - pitch increases or changes with vehicle speed
- Powertrain mount(s)
- CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, REFER to Section 303-01 . For transmission, REFER to Section 307-01 . TEST the system for normal operation after the repair.
- Clunk - occurs when shifting from PARK or between REVERSE and DRIVE
- Powertrain mounts
- CHECK the powertrain/drivetrain mounts for damage. INSTALL new mounts as necessary. For engine, REFER to Section 303-01 . For transmission, REFER to Section 307-01 . TEST the system for normal operation after the repair.
- Idle speed is too high
- CHECK for the correct idle speed.
- Accessory drive bearing hoot - occurs at idle or high idle in cold temperatures of approximately +4°C (+40°F) or colder at the first start of the day
- Accessory drive idler or tensioner pulley bearing is experiencing stick/slip between ball bearings and the bearing race
- CARRY OUT the engine cold soak procedure. REFER to Section 100-04 .
- PLACE the EngineEAR probe directly on the idler/tensioner center post or bolt to verify which bearing is making the noise. INSTALL new parts as necessary. REFER to Section 303-05 . TEST the system for normal operation after the repair.
- Accessory drive belt noise, squeal or chirping
- Defective/worn or incorrect accessory drive belt
- Misaligned pulley(s)
- Pulley runout
- Damaged or worn accessory drive component or idler
- Fluid contamination of the accessory drive belt or pulleys
- Damaged or worn accessory drive belt tensioner
- Damaged pulley grooves
- CARRY OUT the Engine Accessory Test. REFER to Section 100-04 . INSPECT components and INSTALL new parts as necessary. REFER to Section 303-05 . TEST the system for normal operation after the repair.
- Clunking noise

- Coolant pump has excessive end play or imbalance
- CHECK the coolant pump for excessive end play. INSPECT the coolant pump for imbalance with the drive belt off. INSTALL a new coolant pump as necessary. REFER to Section 303-03 . TEST the system for normal operation after the repair.
- Whine or moaning noise
- Air intake system
- CHECK the air cleaner and ducts for correct fit. INSPECT the air intake system for leaks or damage. REPAIR as necessary. TEST the system for normal operation after the repair.
- Whistling noise - normally accompanied with poor idle condition
- Air intake system
- CHECK the air intake ducts, air cleaner, throttle body and vacuum hoses for leaks and correct fit. REPAIR or ADJUST as necessary. TEST the system for normal operation after the repair.
- Hissing noise - occurs during idle or high idle that is apparent with the hood open
- Vehicles with a plastic intake manifold
- Acceptable condition. Some plastic manifolds exhibit this noise, which is the effect of the plastic manifold.
- Grinding noise - occurs during engine cranking
- Incorrect starter motor mounting
- INSPECT the starter motor for correct mounting. REPAIR as necessary. REFER to Section 303-06 . TEST the system for normal operation after the repair.
- Starter motor
- CHECK the starter motor. INSTALL a new starter motor as necessary. REFER to Section 303-06 . TEST the system for normal operation after the repair.
- Incorrect starter motor drive engagement
- INSPECT the starter motor drive for wear or damage. INSTALL a new starter motor as necessary. REFER to Section 303-06 . TEST the system for normal operation after the repair.
- INSPECT the flexplate for wear or damage. INSTALL a new flexplate as necessary. REFER to Section 303-01 . TEST the system for normal operation after the repair.
- Engine noise, front of engine - knocking noise from lower front of engine
- Damaged or separated crankshaft pulley/damper
- CHECK for obvious signs of damage or wobble during operation. INSTALL new as necessary. REFER to Section 303-01 . TEST the system for normal operation after the repair.
- Engine noise, front of engine - ticking, tapping or rattling noise from the front of the engine

- Timing drive components
- REMOVE the accessory drive belt. REFER to Section 303-05 .
- USE the EngineEAR to isolate the noise to the engine front cover.
- REMOVE the engine front cover and INSPECT the timing drive components. INSTALL new parts as necessary. REFER to Section 303-01 . TEST the system for normal operation after the repair.
- Engine noise, upper end - ticking noise near the fuel rail and intake manifold
- Fuel rail clip
- CHECK for loose or damaged fuel rail clip(s). REPAIR as necessary. TEST the system for normal operation after the repair.
- Fuel injector
- USE the EngineEAR to isolate the noisy injector(s). INSTALL a new injector(s) as necessary. REFER to Section 303-04 . TEST the system for normal operation after the repair.
- Engine noise, upper end - ticking, knocking or rattle noise that occurs during idle or high idle during the first cold start of the day and may disappear as the engine warms
- Valve train noise (bled down valve/lash adjuster)
- CARRY OUT the Valve Train Analysis Component Test in this section. INSTALL new parts as necessary. TEST the system for normal operation after the repair.
- Engine noise, upper end - occurs mostly with a warm engine at light/medium acceleration
- Worn or damaged spark plugs
- REMOVE the spark plugs. INSPECT and INSTALL new as necessary. REFER to Section 303-07 . TEST the system for normal operation after the repair.
- Carbon accumulation in combustion chamber
- Bore scope the cylinder. ELIMINATE carbon buildup. TEST the system for normal operation after the repair.
- Engine noise, upper end - rattling noise from the valve train. Worse when the engine is cold
- Low oil level
- CHECK the oil level. FILL as necessary. TEST the system for normal operation after the repair.
- Thin or diluted oil
- INSPECT the oil for contamination. If the oil is contaminated, CHECK for the source. REPAIR as necessary. CHANGE the oil and filter. TEST the system for normal operation after the repair.
- Low oil pressure
- CARRY OUT an oil pressure test. If not within specifications, REMOVE the engine oil pan. REFER to Section 303-01 . INSPECT for a blocked oil pick up tube.

- Worn valve train components
- CARRY OUT the Valve Train Analysis Component Test in this section. INSTALL new parts as necessary. TEST the system for normal operation after the repair.
- Worn valve guides
- CARRY OUT the Valve Guide Inner Diameter procedure in this section.
- Excessive runout of the valve seats on the valve face
- CARRY OUT the Valve Seat Inspection procedure in this section.
- Engine noise, upper end - pinging noise
- Gasoline octane too low
- VERIFY with customer the type of gasoline used. CORRECT as necessary. TEST the system for normal operation after the repair.
- Knock Sensor (KS) operation
- CHECK the KS . INSTALL a new KS as necessary. REFER to Section 303-14 .
- Incorrect spark timing
- CHECK the spark timing. REPAIR as necessary. TEST the system for normal operation after the repair.
- High operating temperature
- INSPECT the cooling system for leaks. CHECK the coolant level. REFILL as necessary. CHECK the coolant for the correct mix ratio. DRAIN and REFILL as needed. VERIFY the engine operating temperature is within specifications. REPAIR as necessary. TEST the system for normal operation after the repair.
- Spark plug
- CHECK the spark plugs. REPAIR or INSTALL new spark plugs as necessary. TEST the system for normal operation after the repair.
- Catalytic converter
- Acceptable noise.
- Engine noise, lower end - ticking or knocking noise near the oil filter adapter
- Oil pump
- USE the EngineEAR to verify the oil pump as the source of the noise at low rpm. REPAIR as necessary. REFER to Section 303-01 . TEST the system for normal operation after the repair.
- Engine noise, lower end - light knocking noise, also described as piston slap. Noise is most noticeable when the engine is cold with light to medium acceleration. The noise disappears as the engine warms

- Excessive clearance between the piston and the cylinder wall
- CARRY OUT the Piston To Cylinder Bore Clearance procedure in this section.
- Engine noise, lower end - light double knock or sharp rap sound. Occurs mostly with a warm engine at idle or low speeds in drive. Increases in relation to engine load. Associated with a poor lubrication history
- Excessive clearance between the piston and the piston pin
- CARRY OUT the Piston Pin Bore Diameter procedure in this section.
- Engine noise, lower end - light knocking noise. The noise is most noticeable when the engine is warm. The noise tends to decrease when the vehicle is coasting or in neutral
- Excessive clearance between the connecting rod bearings and the crankshaft
- CARRY OUT the Connecting Rod Bearing Journal-to-Bearing Clearance procedure in this section.
- Engine noise, lower end - deep knocking noise. The noise is most noticeable when the engine is warm, at lower rpm and under a light load and then at float
- Worn or damaged crankshaft main bearings
- CARRY OUT the Crankshaft Main Bearing Journal-to-Bearing Clearance procedure in this section.
- Engine noise, rear of engine - knocking noise at rear of engine
- Damaged flexplate
- CARRY OUT the Flexplate Inspection procedure in this section.
- Engine vibration - vibration felt at all times
- Excessive engine pulley runout
- CARRY OUT the Engine Accessory Test. INSTALL a new engine pulley as necessary. REFER to Section 303-01 . TEST the system for normal operation after the repair.
- Damaged or worn accessory component
- CARRY OUT the Engine Accessory Test. REPAIR or INSTALL a new component as necessary. TEST the system for normal operation after the repair.
- Engine vibration - at idle, a low-frequency vibration (5-20 Hz) or mild shake that is felt through the seat/floorpan
- Cylinder misfire
- Using the scan tool, CARRY OUT the cylinder power balance and the relative compression test. REPAIR as necessary. REFER the Section 303-01 . TEST the system for normal operation after the repair.
- Engine or torque converter out of balance

- VERIFY the torque converter to crankshaft pilot clearance is correct. REPAIR as necessary. RE-INDEX the torque converter on the flex plate by 120 degrees for a 3-bolt converter or 180 degrees for a 4-bolt converter. REFER to Section 307-01 . TEST the system for normal operation after the repair.
- Engine vibration - is felt with increases and decreases in engine rpm
- Powertrain mount(s)
- CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, REFER to Section 303-01 . For the transmission, REFER to Section 307-01 . TEST the system for normal operation after the repair.
- Engine or transmission grounded to chassis
- INSPECT the powertrain/drivetrain for correct clearances. REPAIR as necessary. TEST the system for normal operation after the repair.
- Engine vibration - increases intensity as the engine rpm is increased
- Engine out-of-balance
- CARRY OUT the Neutral Engine Run-Up (NERU) Test. REFER to Section 100-04 . ROTATE the torque converter, 120 degrees for 3-bolt or 180 degrees for 4-bolt. INSPECT the torque converter pilot outer diameter-to-crankshaft pilot inner diameter. REPAIR as necessary. REFER to Section 307-01 . TEST the system for normal operation after the repair.
- Engine vibration - mostly at coast/neutral coast. Condition improves with vehicle acceleration
- Combustion instability
- CHECK the ignition system. INSTALL new components as necessary. REFER to Section 303-07 . TEST the system for normal operation after the repair.
- Engine vibration or shudder - occurs with light to medium acceleration above 56 km/h (35 mph)
- Worn or damaged spark plugs
- INSPECT the spark plugs for cracks, high resistance or broken insulators. INSTALL a new spark plug(s) as necessary. REFER to Section 303-07 . TEST the system for normal operation after the repair.
- Plugged fuel injector
- REPAIR or INSTALL a new injector as necessary. REFER to Section 303-04 . TEST the system for normal operation after the repair.
- Contaminated fuel
- INSPECT the fuel for contamination. DRAIN the fuel system and refill. TEST the system for normal operation after the repair.

## Component Tests



The following component tests are used to diagnose engine concerns.

### Engine Oil Leaks

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

**NOTE:** When diagnosing engine oil leaks, the source and location of the leak must be positively identified prior to repair.

Prior to carrying out this procedure, clean the cylinder block, cylinder heads, valve covers, oil pan and flywheel with a suitable solvent to remove all traces of oil.

### Engine Oil Leaks - Fluorescent Oil Additive Method

Use the 12 Volt Master UV Diagnostic Inspection Kit to carry out the following procedure for oil leak diagnosis.

1. Add 29.6 ml (1 oz) of gasoline engine oil dye to a minimum of 0.47L (1/2 qt) and a maximum of 0.95L (1 qt) engine oil and fill through the engine oil fill. Thoroughly premix the gasoline engine oil dye or it will not have enough time to reach the crankcase, oil galleries and seal surfaces during this particular 15 minute test. The additive must be mixed well with oil and added through the oil fill. Check the level on the oil level indicator to determine what amount of oil to premix. If it is in the middle of the crosshatch area or below the full mark, use 0.95L (1 qt). If it is at the full mark, use 0.47L (1/2 qt).
2. Run the engine for 15 minutes. Stop the engine and inspect all seal and gasket areas for leaks using the UV Leak Detector Kit. A clear bright yellow or orange area will identify the leak. For extremely small leaks, several hours may be required for the leak to appear.
3. At the end of test, make sure the oil level is within the upper and lower oil indicator marks. Remove oil as necessary if it registers above the full mark.

### Leakage Points - Underhood

Examine the following areas for oil leakage:

- Valve cover gaskets
- Intake manifold gaskets
- Cylinder head gaskets
- Oil bypass filter
- Oil filter adapter
- Engine front cover
- Oil filter adapter and filter body
- Oil level indicator tube connection
- Engine Oil Pressure (EOP) switch

### Leakage Points - Under Engine, With Vehicle on Hoist

Examine the following areas for oil leakage:

- Oil pan gaskets

- Oil pan sealer
- Oil pan rear seal
- Engine front cover gasket
- Crankshaft front seal
- Crankshaft rear oil seal
- Crankshaft main bearing cap side bolts
- Oil filter adapter and filter body
- Oil cooler, if equipped

### Leakage Points - With Transmission and Flywheel Removed

**⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Examine the following areas for oil leakage:

- Crankshaft rear oil seal
- Rear main bearing cap parting line
- Rear main bearing cap seals
- Flexplate mounting bolt holes (with flexplate installed)
- Camshaft rear bearing covers or pipe plugs at the end of oil passages

Oil leaks at crimped seams in sheet metal parts and cracks in cast or stamped parts can be detected when using the dye method.

### Compression Test

**⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

1. Make sure the oil in the crankcase is of the correct viscosity and at the correct level and that the battery is correctly charged. Operate the vehicle until the engine is at normal operating temperature. Turn the ignition switch to the OFF position, then remove all the spark plugs.
2. Set the throttle plates in the wide-OPEN position.
3. Install a compression gauge such as the Compression Tester in the No. 1 cylinder.
4. Install an auxiliary starter switch in the starting circuit. With the ignition switch in the OFF position, and using the auxiliary starter switch, crank the engine a minimum of 5 compression strokes and record the highest reading. Note the approximate number of compression strokes necessary to obtain the highest reading.
5. Repeat the test on each cylinder, cranking the engine approximately the same number of compression strokes.
6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

## Compression Test - Test Results

The indicated compression pressures are considered within specification if the lowest reading cylinder is at least 75% of the highest reading. Refer to the Compression Pressure Limit Chart.

### Compression Pressure Limit Chart

Maximum Recorded Cylinder Pressure	Minimum Recorded Cylinder Pressure	Maximum Recorded Cylinder Pressure	Minimum Recorded Cylinder Pressure	Maximum Recorded Cylinder Pressure	Minimum Recorded Cylinder Pressure	Maximum Recorded Cylinder Pressure	Minimum Recorded Cylinder Pressure
924 kPa (134 psi)	696 kPa (101 psi)	1,131 kPa (164 psi)	848 kPa (123 psi)	1,338 kPa (194 psi)	1,000 kPa (145 psi)	1,544 kPa (224 psi)	1,158 kPa (168 psi)
938 kPa (136 psi)	703 kPa (102 psi)	1,145 kPa (166 psi)	855 kPa (124 psi)	1,351 kPa (196 psi)	1,014 kPa (147 psi)	1,558 kPa (226 psi)	1,165 kPa (169 psi)
952 kPa (138 psi)	717 kPa (104 psi)	1,158 kPa (168 psi)	869 kPa (126 psi)	1,365 kPa (198 psi)	1,020 kPa (148 psi)	1,572 kPa (228 psi)	1,179 kPa (171 psi)
965 kPa (140 psi)	724 kPa (105 psi)	1,172 kPa (170 psi)	876 kPa (127 psi)	1,379 kPa (200 psi)	1,034 kPa (150 psi)	1,586 kPa (230 psi)	1,186 kPa (172 psi)
979 kPa (142 psi)	738 kPa (107 psi)	1,186 kPa (172 psi)	889 kPa (129 psi)	1,393 kPa (189 psi)	1,041 kPa (151 psi)	1,600 kPa (232 psi)	1,200 kPa (174 psi)
993 kPa (135 psi)	745 kPa (108 psi)	1,200 kPa (174 psi)	903 kPa (131 psi)	1,407 kPa (204 psi)	1,055 kPa (153 psi)	1,614 kPa (234 psi)	1,214 kPa (176 psi)
1,007 kPa (146 psi)	758 kPa (110 psi)	1,214 kPa (176 psi)	910 kPa (132 psi)	1,420 kPa (206 psi)	1,062 kPa (154 psi)	1,627 kPa (236 psi)	1,220 kPa (177 psi)
1,020 kPa (148 psi)	765 kPa (111 psi)	1,227 kPa (178 psi)	917 kPa (133 psi)	1,434 kPa (208 psi)	1,075 kPa (156 psi)	1,641 kPa (238 psi)	1,227 kPa (178 psi)
1,034 kPa (150 psi)	779 kPa (113 psi)	1,241 kPa (180 psi)	931 kPa (135 psi)	1,448 kPa (210 psi)	1,083 kPa (157 psi)	1,655 kPa (240 psi)	1,241 kPa (180 psi)
1,048 kPa (152 psi)	786 kPa (114 psi)	1,255 kPa (182 psi)	936 kPa (136 psi)	1,462 kPa (212 psi)	1,089 kPa (158 psi)	1,669 kPa (242 psi)	1,248 kPa (181 psi)
1,062 kPa (154 psi)	793 kPa (115 psi)	1,269 kPa (184 psi)	952 kPa (138 psi)	1,476 kPa (214 psi)	1,103 kPa (160 psi)	1,682 kPa (244 psi)	1,262 kPa (183 psi)
1,076 kPa (156 psi)	807 kPa (117 psi)	1,282 kPa (186 psi)	965 kPa (140 psi)	1,489 kPa (216 psi)	1,117 kPa (162 psi)	1,696 kPa (246 psi)	1,269 kPa (184 psi)
1,089 kPa (158 psi)	814 kPa (118 psi)	1,296 kPa (188 psi)	972 kPa (141 psi)	1,503 kPa (218 psi)	1,124 kPa (163 psi)	1,710 kPa (248 psi)	1,282 kPa (186 psi)
1,103 kPa (160 psi)	827 kPa (120 psi)	1,310 kPa (190 psi)	979 kPa (142 psi)	1,517 kPa (220 psi)	1,138 kPa (165 psi)	1,724 kPa (250 psi)	1,289 kPa (187 psi)
1,110 kPa (161 psi)	834 kPa (121 psi)	1,324 kPa (192 psi)	993 kPa (144 psi)	1,631 kPa (237 psi)	1,145 kPa (166 psi)	—	—

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If one or more cylinders reads low, squirt approximately one tablespoon of engine oil meeting Ford specification on top of the pistons in the low-reading cylinders. Repeat the compression pressure check on these cylinders.

### Compression Test - Interpreting Compression Readings

1. If compression improves considerably, piston rings are worn or damaged.
2. If compression does not improve, valves are sticking or not seating correctly.
3. If 2 adjacent cylinders indicate low compression pressures and squirting oil on each piston does not increase compression, the head gasket may be leaking between cylinders. Engine oil or coolant in cylinders could result from this condition.  
Use the Compression Pressure Limit Chart when checking cylinder compression so that the lowest reading is within 75% of the highest reading.

### Cylinder Leakage Detection

When a cylinder produces a low reading, use of the Engine Cylinder Leak Detection/Air Pressurization Kit will be helpful in pinpointing the exact cause.

The leakage detector is inserted in the spark plug hole, the piston is brought up to top dead center on the compression stroke, and compressed air is admitted.

Once the combustion chamber is pressurized, a special gauge included in the kit will read the percentage of leakage. Leakage exceeding 20% is excessive.

While the air pressure is retained in the cylinder, listen for the hiss of escaping air. A leak at the intake valve will be heard in the throttle body. A leak at the exhaust valve can be heard at the tailpipe. Leakage past the piston rings will be audible at the PCV connection. If air is passing through a blown head gasket to an adjacent cylinder, the noise will be evident at the spark plug hole of the cylinder into which the air is leaking. Cracks in the cylinder block or gasket leakage into the cooling system may be detected by a stream of bubbles in the radiator.

### Excessive Engine Oil Consumption


Nearly all engines consume oil, which is essential for normal lubrication of the cylinder bore walls and pistons and rings. Determining the level of oil consumption may require testing by recording how much oil is being added over a given set of miles.

Customer driving habits greatly influence oil consumption. Mileage accumulated during towing or heavy loading generates extra heat. Frequent short trips, stop-and-go type traffic or extensive idling, prevent the engine from reaching normal operating temperature. This prevents component clearances from reaching specified operating ranges.

The following diagnostic procedure may be utilized to determine internal oil consumption. Make sure that the concern is related to internal oil consumption, and not external leakage, which also consumes oil. Verify there are no leaks before carrying out the test. Once verified, the rate of internal oil consumption can be tested.

A new engine may require extra oil in the early stages of operation. Internal piston-to-bore clearances and sealing characteristics improve as the engine breaks in. Engines are designed for close tolerances and do not require break-in oils or additives. Use the oil specified in the Owner's Literature. Ambient temperatures may determine the oil viscosity specification. Verify that the correct oil is being used for the vehicle in the geographic region in which it is driven.

### Basic Pre-checks

1.  **WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.**

For persistent complaints of oil consumption, interview the customer to determine the oil consumption characteristics. If possible, determine the brand and grade of oil currently in the oil pan. Look at the oil filter or oil-change station tags to determine if Ford-recommended maintenance schedules have been followed. Make sure that the oil has been changed at the specified mileage intervals. If vehicle mileage is past the first recommended drain interval, the OEM production filter should have been changed.

2. Ask how the most current mileage was accumulated. That is, determine whether the vehicle was driven under the following conditions:
  - Extended idling or curbside engine operation
  - Stop-and-go traffic or taxi operation
  - Towing a trailer or vehicle loaded heavily
  - Frequent short trips (engine not up to normal operating temperature)
  - Excessive throttling or high engine-rpm driving
3. Verify that there are no external leaks. If necessary, review the diagnostic procedure under Engine Oil Leaks in the Diagnosis and Testing portion of this section.
4. Inspect the crankcase ventilation system for:

- disconnected hoses at the valve cover or throttle body.
  - loose or missing valve cover fill cap.
  - missing or incorrectly seated engine oil level indicator.
  - incorrect or dirty PCV valve.
  - a PCV valve grommet unseated in the valve cover (if so equipped).
5. Inspect for signs of sludge. Sludge affects PCV performance and can plug or restrict cylinder head drainback wells. It can also increase oil pressure by restricting passages and reducing the drainback capability of piston oil control rings. Sludge can result from either excessive water ingestion in the crankcase or operation at extremely high crankcase temperatures.
  6. Inspect the air filter for dirt, sludge or damage. A hole in the filter element will allow unfiltered air to bypass into the air induction system. This can cause premature internal wear (engine dusting), allowing oil to escape past rings, pistons, valves and guides.
  7. If the engine is hot or was recently shut down, wait at least 5 minutes to allow the oil to drain back. Ask the customer if this requirement has been followed. Adding oil without this wait period can cause an overfill condition, leading to excessive oil consumption and foaming which may cause engine damage.
  8. Make sure the oil level indicator (dipstick) is correctly and fully seated in the indicator tube. Remove the oil level indicator and record the oil level.
  9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

### Detailed Pre-checks

1. Check the thermostat opening temperature to make sure that the cooling system is operating at the specified temperature. If it is low, internal engine parts are not running at specified internal operating clearances.
2. Verify the spark plugs are not oil saturated. Oil leaking into one or more cylinders will appear as an oil soaked condition on the plug. If a plug is saturated, a compression check may be necessary at the conclusion of the oil consumption test.

### Oil Consumption Test

Once all of the previous conditions are met, carry out an oil consumption test.

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

Drain the engine oil and remove the oil filter. Install a new manufacturer-specified oil filter. Make sure the vehicle is positioned on a level surface. Refill the oil pan to a level **one liter (quart) less** than the specified fill level, using manufacturer-specified oil.

2. Run the engine for 3 minutes (if hot) or 10 minutes (if cold). Allow for a minimum 5-minute drainback period and then record the oil level shown on the oil level indicator. Place a mark on the backside of the oil level indicator noting the oil level location.

3. Add the final one liter (quart) to complete the normal oil fill. Restart the engine and allow it to idle for 2 minutes. Shut the engine down.
4. After a 5-minute drainback period, record the location of the oil level again. Mark the oil level indicator with the new oil level location. (Note: Both marks should be very close to the MIN-MAX upper and lower limits or the upper and lower holes on the oil level indicator. These marks will exactly measure the engine's use of oil, with a one quart differential between the new marks.) Demonstrate to the customer that the factory-calibrated marks on the oil level indicator are where the oil should fall after an oil change with the specified fill amount. Explain however, that this may vary slightly between MIN-MAX or the upper and lower holes on the oil level indicator.
5. Record the vehicle mileage.
6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

7. Advise the customer that oil level indicator readings must be taken every 320 km (200 mi) or weekly, using the revised marks as drawn. Remind the customer that the engine needs a minimum 5-minute drainback for an accurate reading and that the oil level indicator must be firmly seated in the tube prior to taking the reading.
8. When the subsequent indicator readings demonstrate a full liter (quart) has been used, record the vehicle mileage. The mileage driven between the 2 readings should not be less than 4,800 km (3,000 miles). The drive cycle the vehicle has been operated under must be considered when making this calculation. It may be necessary to have the customer bring the vehicle in for a periodic oil level indicator reading to closely monitor oil usage.

### Post Checks, Evaluation and Corrective Action

1. If test results indicate excessive oil consumption, carry out a cylinder compression test. The cylinder compression test should be carried out with a fully charged battery and all spark plugs removed. See the Compression Test Chart in this section for pressure range limits.
2. Compression should be consistent across all cylinders. Refer to the Compression Testing portion of this section. If compression tested within the specifications found in this section, the excessive oil consumption may be due to wear on the valve guides, valves or valve seals.
3. A cylinder leak detection test can be carried out using an Engine Cylinder Leak Detection/Air Pressurization Kit. This can help identify valves, piston rings, or worn valve guides/valve stems, inoperative valve stem seals or other related areas as the source of oil consumption.

**NOTE:** An oil-soaked appearance on the porcelain tips of the spark plugs also indicates excessive oil use. A typical engine with normal oil consumption will exhibit a light tan to brown appearance. See Spark Plug Analysis in this section for details. A single or adjoining, multiple cylinder leak can be traced by viewing the tips.

4. If an internal engine part is isolated as the root cause, determine if the repair will exceed cost limits and proceed with a repair strategy as required.
5. Once corrective action to engine is complete and verifying that all pre-check items were eliminated in the original diagnosis, repeat the Oil Consumption Test as described above and verify consumption

results.

### Intake Manifold Vacuum Test

Bring the engine to normal operating temperature. Connect the Vacuum/Pressure Tester to the intake manifold. Run the engine at the specified idle speed.

The vacuum gauge should read between 51-74 kPa (15-22 in-Hg) depending upon the engine condition and the altitude at which the test is conducted. Subtract 4.0193 kPa (1 in-Hg) from the specified reading for every 304.8 m (1,000 ft) of elevation above sea level.

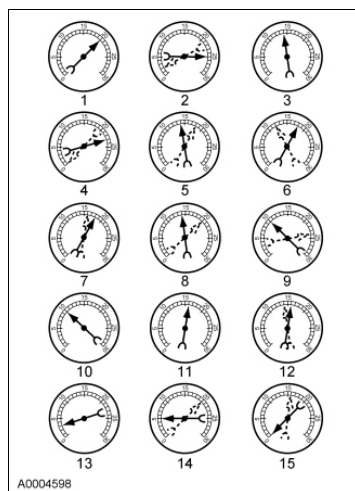
The reading should be steady. If necessary, adjust the gauge damper control (where used) if the needle is fluttering rapidly. Adjust the damper until the needle moves easily without excessive flutter.

### Intake Manifold Vacuum Test - Interpreting Vacuum Gauge Readings

A careful study of the vacuum gauge reading while the engine is idling will help pinpoint trouble areas. Always conduct other appropriate tests before arriving at a final diagnostic decision. Vacuum gauge readings, although helpful, must be interpreted carefully.

Most vacuum gauges have a normal band indicated on the gauge face.


The following are potential gauge readings. Some are normal; others should be investigated further.



1. **NORMAL READING:** Needle between 51-74 kPa (15-22 in-Hg) and holding steady.
2. **NORMAL READING DURING RAPID ACCELERATION AND DECELERATION:** When the engine is rapidly accelerated (dotted needle), the needle will drop to a low reading (not to zero). When the throttle is suddenly released, the needle will snap back up to a higher than normal figure.
3. **NORMAL FOR HIGH-LIFT CAMSHAFT WITH LARGE OVERLAP:** The needle will register as low as 51 kPa (15 in-Hg) but will be relatively steady. Some oscillation is normal.
4. **WORN RINGS OR DILUTED OIL:** When the engine is accelerated (dotted needle), the needle drops to 0 kPa (0 in-Hg). Upon deceleration, the needle runs slightly above 74 kPa (22 in-Hg).
5. **STICKING VALVES:** When the needle (dotted) remains steady at a normal vacuum but occasionally flicks (sharp, fast movement) down and back about 13 kPa (4 in-Hg), one or more valves may be sticking.

6. **BURNED OR WARPED VALVES:** A regular, evenly-spaced, downscale flicking of the needle indicates one or more burned or warped valves. Insufficient valve clearance will also cause this reaction.
7. **POOR VALVE SEATING:** A small but regular downscale flicking can mean one or more valves are not seating.
8. **WORN VALVE GUIDES:** When the needle oscillates over about a 13 kPa (4 in-Hg) range at idle speed, the valve guides could be worn. As engine speed increases, the needle will become steady if guides are responsible.
9. **WEAK VALVE SPRINGS:** When the needle oscillation becomes more violent as engine rpm is increased, weak valve springs are indicated. The reading at idle could be relatively steady.
10. **LATE VALVE TIMING:** A steady but low reading could be caused by late valve timing.
11. **IGNITION TIMING RETARDING:** Retarded ignition timing will produce a steady but somewhat low reading.
12. **INSUFFICIENT SPARK PLUG GAP:** When spark plugs are gapped too close, a regular, small pulsation of the needle can occur.
13. **INTAKE LEAK:** A low, steady reading can be caused by an intake manifold or throttle body gasket leak.
14. **BLOWN HEAD GASKET:** A regular drop of fair magnitude can be caused by a blown head gasket or warped cylinder head-to-cylinder block surface.
15. **RESTRICTED EXHAUST SYSTEM:** When the engine is first started and is idled, the reading may be normal, but as the engine rpm is increased, the back pressure caused by a clogged muffler, kinked tailpipe or other concerns will cause the needle to slowly drop to 0 kPa (0 in-Hg). The needle then may slowly rise. Excessive exhaust clogging will cause the needle to drop to a low point even if the engine is only idling.
16. When vacuum leaks are indicated, search out and correct the cause. Excess air leaking into the system will upset the fuel mixture and cause concerns such as rough idle, missing on acceleration or burned valves. If the leak exists in an accessory unit such as the power brake booster, the unit will not function correctly. Always fix vacuum leaks.

### Oil Pressure Test

1. ** WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.**

Disconnect and remove the EOP switch from the engine.

2. Connect the Engine Oil Pressure Gauge to the EOP switch oil galley port.
3. Run the engine until normal operating temperature is reached.
4. Run the engine at the specified rpm and record the gauge reading.



5. The oil pressure should be within specifications; for additional information, refer to the specification chart in the appropriate engine section.
6. If the pressure is not within specification, check the following possible sources:
  - Insufficient oil
  - Oil leakage
  - Worn or damaged oil pump
  - Oil pump screen cover and tube
  - Excessive main bearing clearance
  - Excessive connecting rod bearing clearance
7. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

### Valve Train Analysis

The following component tests are used to diagnose valve train concerns.

#### Valve Train Analysis - Engine Off, Valve Cover Removed

Check for damaged or severely worn parts and correct assembly. Make sure correct parts are used with the static engine analysis as follows.

#### Valve Train Analysis - Camshaft, Camshaft Roller Followers and Hydraulic Lash Adjusters

- Check for broken or damaged parts.
- Check for loose mounting bolts on camshaft caps.
- Check for plugged oil feed in the camshaft roller followers, lash adjusters or cylinder heads.

#### Valve Train Analysis - Valve Springs, Valve Spring Retainer and Valve Spring Retainer Keys

- Check for broken or damaged parts.
- Check for correct seating of the valve spring retainer key on the valve stem and in valve spring retainer.
- Check for correct seating on the valve stem.

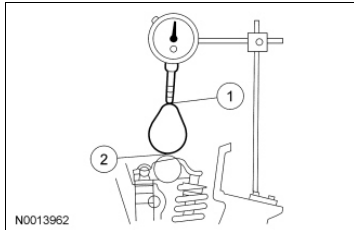
#### Valve Train Analysis - Valves and Cylinder Head

- Check for plugged oil drain back holes.
- Check for worn or damaged valve tips.
- Check for missing or damaged guide-mounted valve stem seal.
- Check collapsed hydraulic lash adjuster.
- Check installed valve spring height.
- Check for missing or worn valve spring seats.
- Check for plugged oil metering orifice in cylinder head oil reservoir (if equipped).

#### Valve Train Analysis - Camshaft Lobe Lift

Check the lift of each camshaft lobe in consecutive order and make a note of the readings.

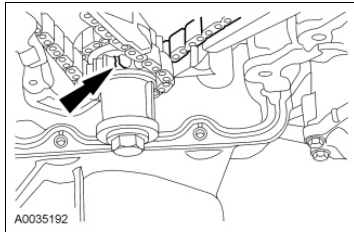
1. Remove the valve covers.
2. Remove the spark plugs. Refer to [Section 303-07](#) .
3. Install the Dial Indicator Gauge with Holding Fixture so the rounded tip of the Dial Indicator is on top of the camshaft lobe and on the same plane as the hydraulic lash adjuster.
4. Rotate the crankshaft using a breaker bar and socket attached to the crankshaft pulley retainer bolt. Rotate the crankshaft until the base circle of the camshaft lobe is reached.



5. Zero the Dial Indicator. Continue to rotate the crankshaft until the (1) high-lift point of the camshaft lobe is in the fully-raised position (highest indicator reading).
  6. To check the accuracy of the original Dial Indicator reading, continue to rotate crankshaft until the (2) base circle is reached. The Dial Indicator reading should be zero. If zero reading is not obtained, repeat Steps 1 through 6.
  7. If the lift on any lobe is below specified service limits, install a new camshaft and camshaft roller followers.
  8. Install the spark plugs. Refer to [Section 303-07](#) .
  9. Install the valve covers.
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## Sprockets

1. Inspect the sprockets for cracks and worn or chipped teeth.

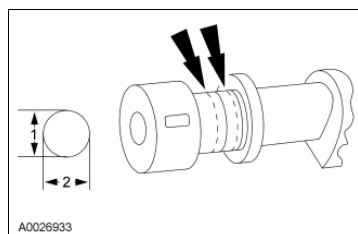


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## Camshaft Bearing Journal Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure each camshaft journal diameter in 2 directions.



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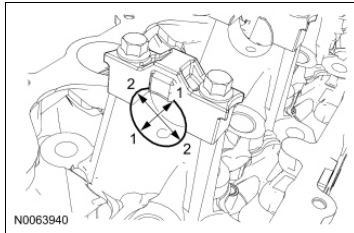
### Camshaft Journal to Bearing Clearance - OHC Engines

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** The camshaft journals must meet specifications before checking camshaft journal clearance.

Measure each camshaft bearing in 2 directions.

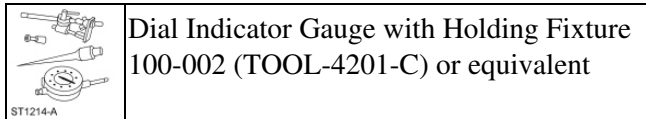
- Subtract the camshaft journal diameter from the camshaft bearing diameter.



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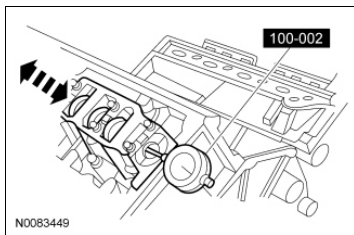
**Camshaft End Play - OHC Engines**

## Special Tool(s)



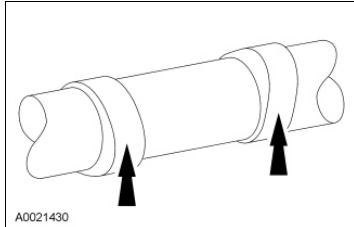
**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Using the Dial Indicator Gauge with Holding Fixture, measure the camshaft end play.
2. Position the camshaft to the rear of the cylinder head.
3. Zero the Dial Indicator Gauge.
4. Move the camshaft to the front of the cylinder head. Note and record the camshaft end play.
  - If camshaft end play exceeds specifications, install a new camshaft and recheck end play.
  - If camshaft end play exceeds specification after camshaft installation, install a new cylinder head.



## Camshaft Surface Inspection

1. Inspect camshaft lobes for pitting or damage in the contact area. Minor pitting is acceptable outside the contact area.



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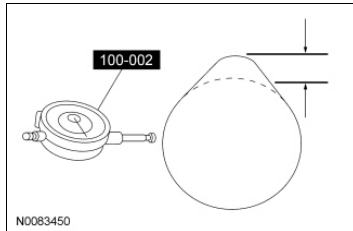
**Camshaft Lobe Lift**

## Special Tool(s)



**NOTE:** Refer to the appropriate Section 303-01 for the specification.

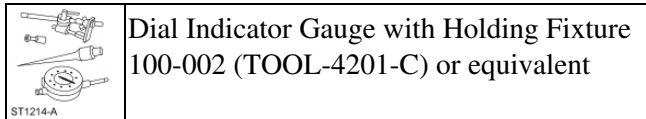
1. Use the Dial Indicator Gauge with Holding Fixture to measure camshaft intake/exhaust lobe lift.
  - Rotate the camshaft and subtract the lowest Dial Indicator Gauge reading from the highest Dial Indicator Gauge reading to figure the camshaft lobe lift.





## Camshaft Runout

### Special Tool(s)

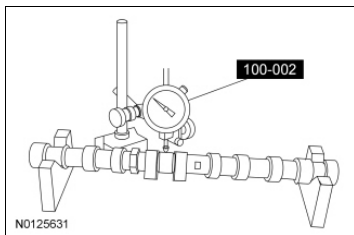


**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** Camshaft journals must be within specifications before checking runout.

Using the Dial Indicator Gauge with Holding Fixture, measure the camshaft runout.

- Camshaft must be supported on the first and last camshaft bearing journal.
- Rotate the camshaft and subtract the lowest Dial Indicator Gauge reading from the highest Dial Indicator Gauge reading.

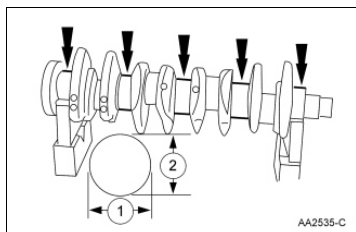


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## Crankshaft Main Bearing Journal Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure each of the crankshaft main bearing journal diameters in at least 2 directions.

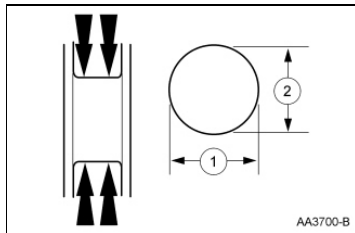


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### Crankshaft Main Bearing Journal Taper and Out-of-Round

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure each of the crankshaft main bearing journal diameters in at least 2 directions at each end of the main bearing journal.

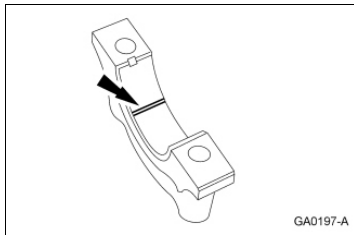


### Crankshaft Main Bearing Journal-to-Bearing Clearance

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

**NOTE:** Crankshaft main bearing journals must be within specifications before checking journal clearance.

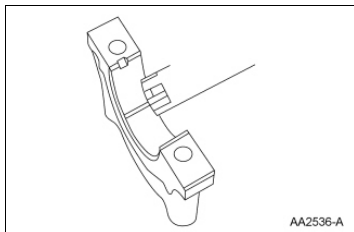
1. Remove the crankshaft main bearing caps and crankshaft main bearing.
2. Lay a piece of Plastigage across the face of each crankshaft main bearing surface.



3. **NOTE:** Do not turn the crankshaft while carrying out this procedure.

Install and remove the crankshaft main bearing cap.

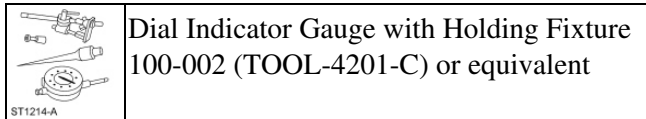
4. Verify the crankshaft journal clearance.



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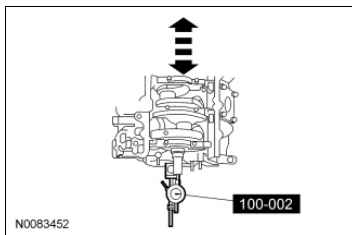
**Crankshaft End Play**

## Special Tool(s)



**NOTE:** Refer to the appropriate Section 303-01 for the specification.

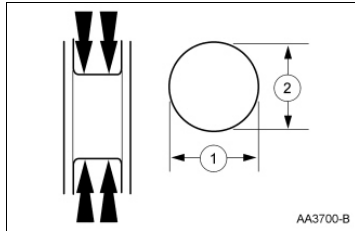
1. Install the Dial Indicator Gauge with Holding Fixture.
2. Position the crankshaft to the rear of the cylinder block.
3. Zero the Dial Indicator Gauge.
4. Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.



## Connecting Rod Bearing Journal Taper and Out-of-Round

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure the crankshaft connecting rod journal diameters in 2 directions perpendicular to one another at each end of the connecting rod journal. The difference in the measurements from one end to the other is the taper. Verify measurement is within the wear limit.

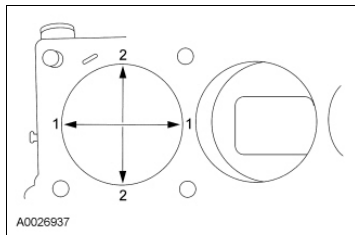


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**Cylinder Bore Taper**

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

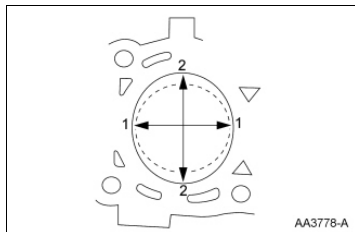
1. Measure the cylinder bore at the top, middle and bottom of piston ring travel in 2 directions as indicated. Verify the cylinder bore is within the wear limit. The difference indicates the cylinder bore taper. If the cylinder bore taper does not meet specification, bore the cylinder to the next oversize limit.



## Cylinder Bore Out-of-Round

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure the cylinder bore in 2 directions. The difference is the out-of-round.





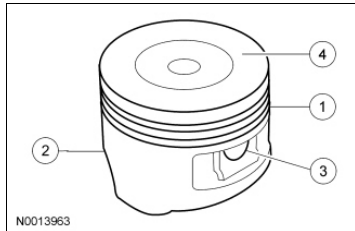
## Piston Inspection

### Special Tool(s)

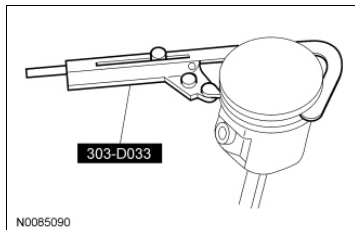
 <p>ST1279-A</p>	<p>Scraper, Piston Ring Groove 303-D033 (D81L-6002-D) or equivalent</p>
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**NOTICE:** Do not use a caustic cleaning solution or a wire brush to clean the pistons or damage can occur.

1. Clean and inspect the (1) ring lands, (2) skirts, (3) pin bosses and the (4) tops of the pistons. If wear marks, scores or glazing is found on the piston skirt, check for a bent or twisted connecting rod.



2. Use the Piston Ring Groove Scraper to clean the piston ring grooves.
  - Make sure the oil ring holes are clean.





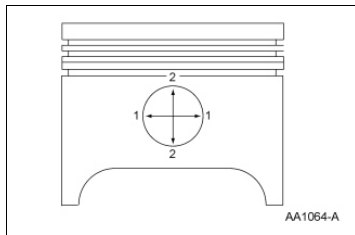
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## Piston Pin Bore Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** Piston and piston pins are a matched set and should not be interchanged.

Measure the piston pin bore diameter in 2 directions on each side. Verify the diameter is within specification.

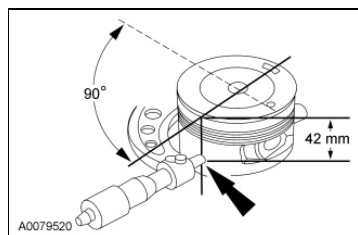


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## Piston Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure the piston diameter 90 degrees from the piston pin and 42 mm (1.65 in) down from the top of the piston at the point indicated.



## **Piston To Cylinder Bore Clearance**

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

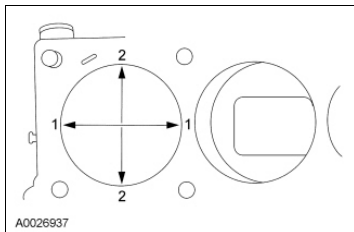
1. Subtract the piston diameter from the cylinder bore diameter to find the piston-to-cylinder bore clearance.
-

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**Piston Selection**

**NOTE:** The cylinder bore must be within the specifications for taper and out-of-round before fitting a piston.

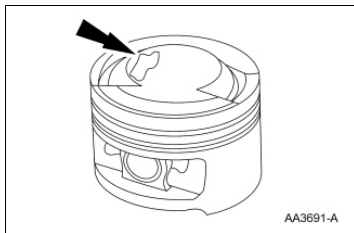
1. Select a piston size based on the cylinder bore.



2. **NOTE:** For precision fit, new pistons are divided into 3 categories within each size range based on their relative position within the range. A paint spot or specific size grade on a new piston indicates the position within the size range.

Choose the piston with the correct paint color or specific size grade.

- Refer to the appropriate section in Group 303 for the procedure.



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**Piston Ring End Gap**

Special Tool(s)

	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
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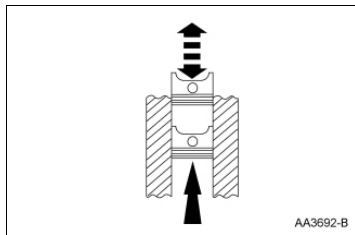
**NOTICE:** Use care when fitting piston rings to avoid possible damage to the piston ring or the cylinder bore.

**NOTE:** Piston rings should not be transferred from one piston to another.

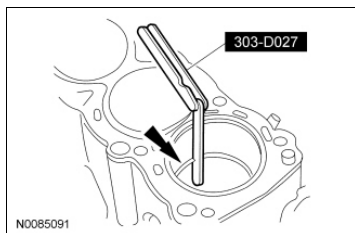
**NOTE:** Refer to the appropriate Section 303-01 for the specification.

**NOTE:** The cylinder bore must be within specification for taper and out-of-round.

1. Use a piston without rings to push a piston ring in a cylinder to the bottom of ring travel.



2. Use the Feeler Gauge Set to measure the top piston ring end gap and the second piston ring end gap.







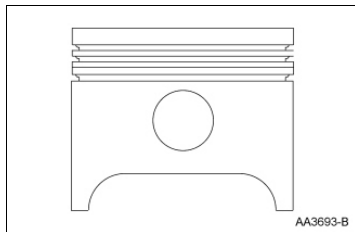
## Piston Ring-to-Groove Clearance

### Special Tool(s)

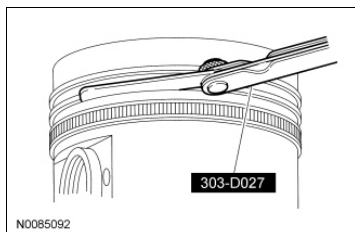
 <p>ST1271-A</p>	<p>Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent</p>
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**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Inspect the piston for ring land damage or accelerated wear.



2. Using the Feeler Gauge Set, measure the piston ring-to-groove clearance.

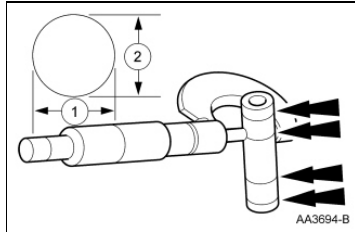


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## Piston Pin Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure the piston pin diameter in 2 directions at the points shown. Verify the diameter is within specification.



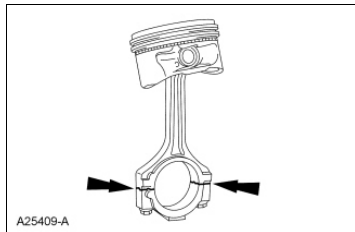
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## Connecting Rod Cleaning

**NOTICE:** Do not use a caustic cleaning solution or damage to connecting rods can occur.

1. **NOTE:** The connecting rod large end is a matched set. The connecting rod cap must be installed on the original connecting rod in the original position. Do not reverse the cap. Parts are not interchangeable.

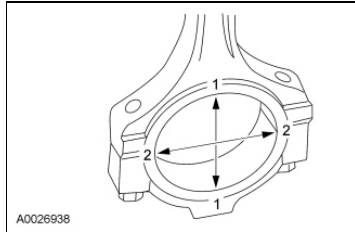
Mark and separate the parts and clean with solvent. Clean the oil passages.



## Connecting Rod Large End Bore

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

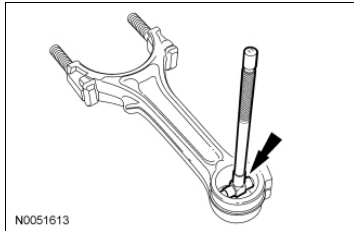
1. Tighten the bolts to specification, then measure the bore in 2 directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round is within specification.



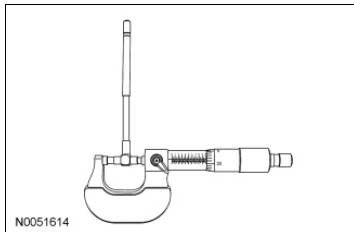
## Connecting Rod Bushing Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Use a telescoping gauge to determine the ID of the connecting rod bushing, if equipped.




2. Measure the telescoping gauge with a micrometer. Verify the diameter is within specification.



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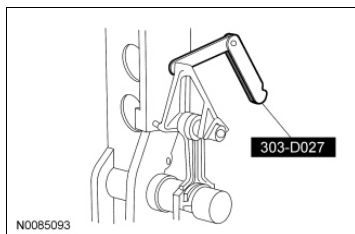
**Connecting Rod Bend**

## Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
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**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Using the Feeler Gauge Set, measure the connecting rod bend on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. Verify the bend measurement is within specification.



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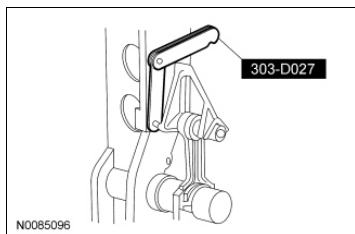
**Connecting Rod Twist**

## Special Tool(s)

	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
---	--

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Using the Feeler Gauge Set, measure the connecting rod twist on a suitable alignment fixture. Follow the instructions of the fixture manufacturer. Verify the measurement is within specification.



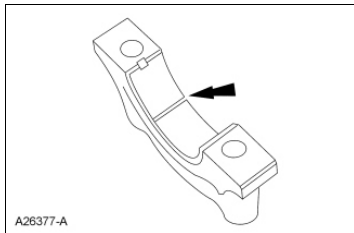
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**Connecting Rod Bearing Journal-to-Bearing Clearance**

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

**NOTE:** The crankshaft connecting rod journals must be within specifications to check the connecting rod bearing journal clearance.

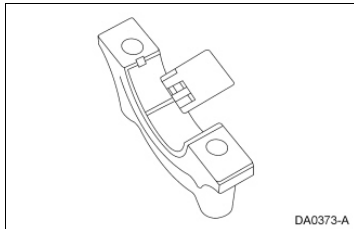
1. Remove the connecting rod bearing cap.
2. Position a piece of Plastigage across the bearing surface.



3. **NOTE:** Do not turn the crankshaft during this step.

Install and tighten to specifications, then remove the connecting rod bearing cap.

4. Measure the Plastigage to get the connecting rod bearing journal clearance. The Plastigage should be smooth and flat. A changing width indicates a tapered or damaged connecting rod or connecting rod bearing.








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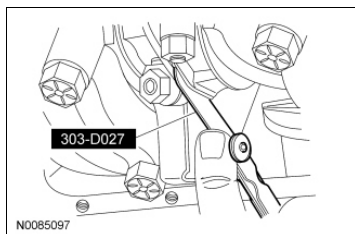
**Connecting Rod to Crankshaft Side Clearance**

## Special Tool(s)

	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
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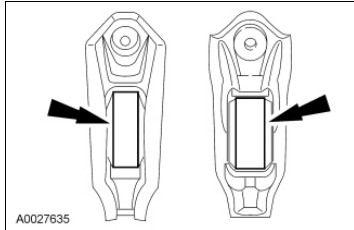
**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Using the Feeler Gauge Set, measure the clearance between the connecting rod and the crankshaft.  
Verify the measurement is within specification.



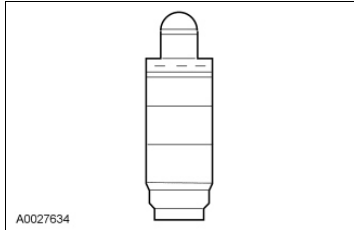
## Roller Follower Inspection

1. Inspect the roller follower for flat spots or scoring. If any damage is found, inspect the camshaft lobes and hydraulic lash adjuster for damage.



### Hydraulic Lash Adjuster Inspection

1. Inspect the hydraulic lash adjuster and roller follower for damage. If any damage is found, inspect the camshaft lobes and valves for damage.

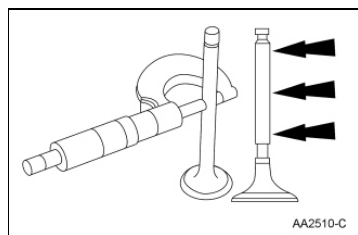


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## Valve Stem Diameter

**NOTE:** Refer to the appropriate Section 303-01 for the specification.



1. Measure the diameter of each intake and exhaust valve stem at the points shown. Verify the diameter is within specification.



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**Valve Stem to Valve Guide Clearance**

## Special Tool(s)

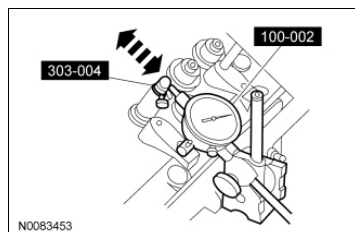
 ST1251-A	Clearance Gauge, Valve Guide 303-004 (TOOL-6505-E) or equivalent
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

**NOTE:** The valve stem diameter must be within specifications before checking valve stem-to-valve guide clearance.

1. **NOTE:** If necessary, use a magnetic base.

Install a Valve Guide Clearance Gauge on the valve stem and install a Dial Indicator Gauge with Holding Fixture. Lower the valve until the clearance gauge contacts the upper surface of the valve guide.



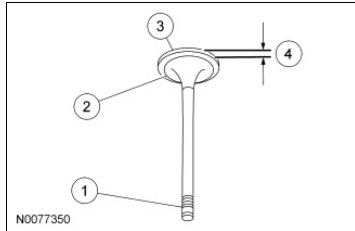
2. Move the Valve Guide Clearance Gauge toward the Dial Indicator Gauge with Holding Fixture and zero the Dial Indicator Gauge. Move the Valve Guide Clearance Gauge away from the Dial Indicator Gauge with Holding Fixture and note the reading. The reading will be DOUBLE the valve stem-to-valve guide clearance.
-



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## Valve Inspection

1. Inspect the following valve areas:
  1. The end of the stem for grooves or scoring.
  2. The valve face and the edge for pits, grooves or scores.
  3. The valve head for signs of burning, erosion, warpage and cracking.
  4. The valve margin for wear.





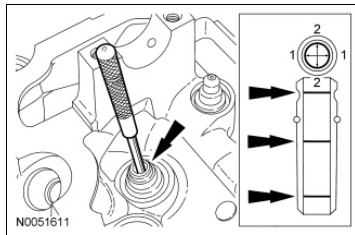
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**Valve Guide Inner Diameter**

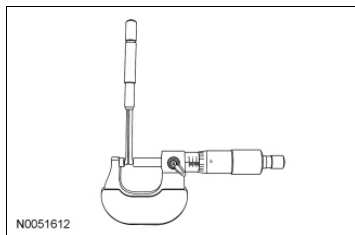
**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** Valve guides tend to wear in an hourglass pattern. The ball gauge can be inserted into the combustion chamber side of the valve guide, if necessary.

Use a ball gauge to determine the inside diameter of the valve guides in 2 directions at the top, middle and bottom of the valve guide.



2. Measure the ball gauge with a micrometer.

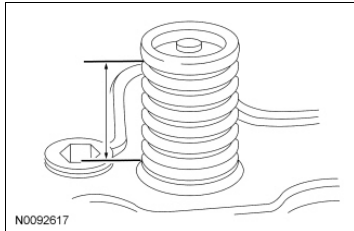


3. If the valve guide is not within specifications, install a new cylinder head assembly.
-

### Valve Spring Installed Length

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

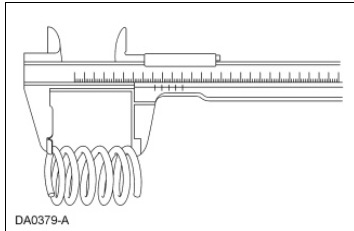
1. Measure the installed length of each valve spring.



## Valve Spring Free Length

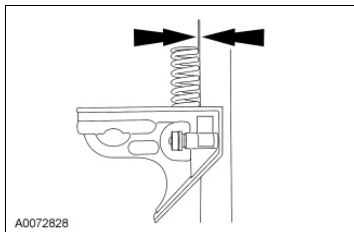
**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Measure the free length of each valve spring.




## Valve Spring Squareness

1. Measure the out-of-square on each valve spring.
  - Turn the valve spring and observe the space between the top of the valve spring and the square.



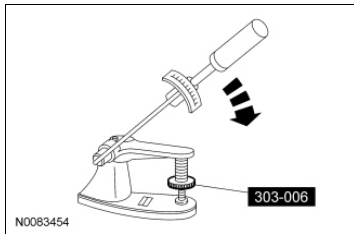
## Valve Spring Strength

### Special Tool(s)

 <p>ST1278-A</p>	<p>Pressure Gauge, Valve/Clutch Spring 303-006 (TOOL-6513-DD) or equivalent</p>
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**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Use the Valve/Clutch Spring Pressure Gauge to check the valve spring for correct strength at the specified valve spring length.



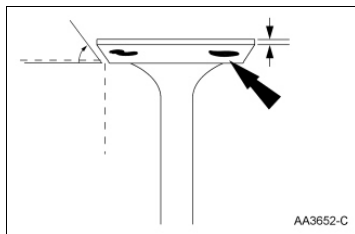
## Valve Seat Inspection

### Valve and Seat Refacing Measurements

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

**NOTE:** After grinding valves or valve seats, check valve clearance.

1. Check the valve head and seat.
  - Check valve angles.
  - Check margin width.
  - Be sure margin width is within specification.

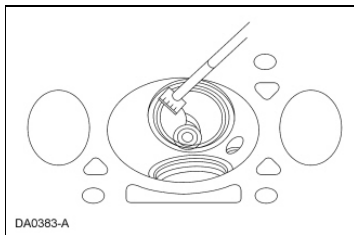


2. Inspect for abnormalities on the valve face and seat. Install a new cylinder head assembly if abnormalities are found.
-

## Valve Seat Width

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

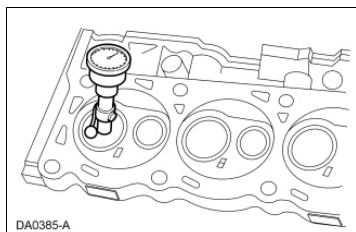
1. Measure the valve seat width. If necessary, grind the valve seat to specification.
  - Measure the intake valve seat width.
  - Measure the exhaust valve seat width.
  - Recheck the valve spring installed length after the seats have been ground, and shim the valve springs as necessary to achieve the correct installed spring length.
  - Depending on the engine, check the valve lash. Refer to General Procedures in Section 303-01.



## Valve Seat Runout

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. Use a valve seat runout gauge to check valve seat runout.





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**Cylinder Block Distortion**

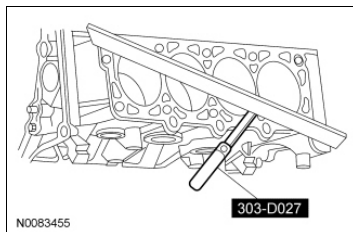
## Special Tool(s)

 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
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**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** Use a Straightedge that is calibrated by the manufacturer to be flat within 0.005 mm (0.0002 in) per running foot of length, such as Snap-On® GA438A or equivalent. For example, if the Straightedge is 61 cm (24 in) long, the machined edge must be flat within 0.010 mm (0.0004 in) from end to end.

Use a Straightedge and a Feeler Gauge Set to inspect the cylinder block for flatness.



**Cylinder Head Distortion**

## Special Tool(s)

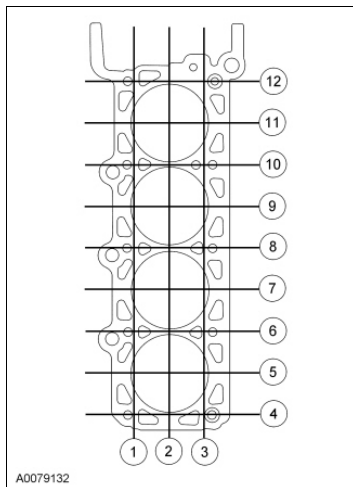
	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
---	--

**NOTE:** Refer to the appropriate Section 303-01 for the specification.

1. **NOTE:** Make sure all cylinder head surfaces are clear of any gasket material, silicone sealant, oil and coolant. The cylinder head surface must be clean and dry before running a flatness check.

**NOTE:** Use a Straightedge that is calibrated by the manufacturer to be flat within 0.005 mm (0.0002 in) per running foot of length, such as Snap-On® GA438A or equivalent. For example, if the Straightedge is 61 cm (24 in) long, the machined edge must be flat within 0.010 mm (0.0004 in) from end to end.

Using a Straightedge and a Feeler Gauge Set, inspect the cylinder head for flatness in the sequence shown.





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**Cylinder Bore Cleaning**

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A


1. **NOTICE:** If these procedures are not followed, rusting of the cylinder bores may occur.

Clean the cylinder bores with soap or detergent and water.

2. Thoroughly rinse with clean water and wipe dry with a clean, lint-free cloth.
  3. Use a clean, lint-free cloth and lubricate the cylinder bores.
    - Use clean engine oil meeting Ford specification.
-

**Core Plug Replacement**

## Special Tool(s)

 ST1195-A	Slide Hammer 100-001 (T50T-100-A)
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## Material

Item	Specification
High Temperature Retaining Compound Loctite® 620TM/Permatex® 62050, or equivalent; obtain locally	WSK-M2G349-A9
Threadlock 262 TA-26	WSK-M2G351-A6

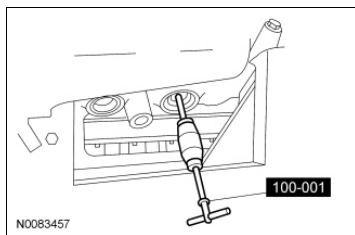
**NOTICE:** It is necessary to use High Temperature Retaining Compound Loctite® 620TM/Permatex® 62050 or equivalent on all 3 valve modular engine cylinder head cup plugs. If not used, the cylinder head cup plugs could leak or seep, causing serious engine damage.

**NOTE:** Use threadlock 262 on all other applications.

**All core plugs**

1. **NOTE:** Cylinder block core plug shown, cylinder head core plug similar.

Use the Slide Hammer and a freeze plug remover to remove the core plug.



2. **NOTE:** Oversize plugs are identified by the OS stamped in the flat located on the cup side of the plug.

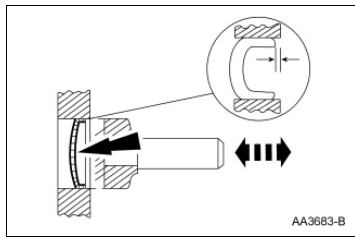
Inspect the core plug bore for any damage that would interfere with the correct sealing of the plug. If the core plug bore is damaged, bore for the next oversize plug.

**Cup-type**

3. **NOTICE:** Use care during this procedure so as not to disturb or distort the cup sealing surface.

**NOTE:** When installed, the flanged edge must be below the chamfered edge of the bore to effectively seal the bore.

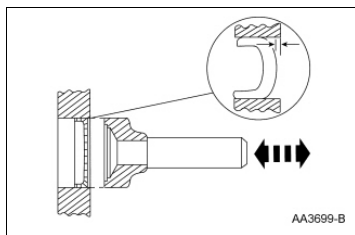
Coat the cup-type core plug and bore lightly with sealant and install the core plug using a freeze plug installer.



### Expansion-type

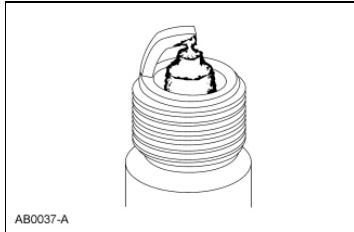
4. **NOTICE:** Do not contact the crown when installing an expansion-type core plug. This could expand the plug before seating and result in leakage.

Coat the expansion-type core plug and bore lightly with sealant and install the core plug using a freeze plug installer.

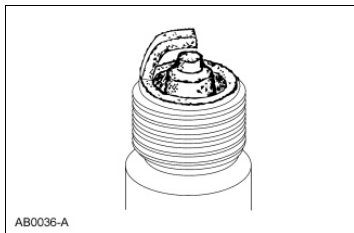


## Spark Plug Inspection

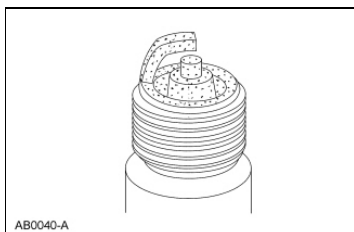
1. Inspect the spark plug for a bridged gap.
  - Check for deposit build-up closing the gap between the electrodes. Deposits are caused by oil or carbon fouling.
  - Install a new spark plug.



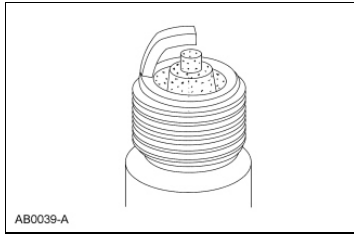
2. Check for oil fouling.
  - Check for wet, black deposits on the insulator shell bore electrodes, caused by excessive oil entering the combustion chamber through worn rings and pistons, excessive valve-to-guide clearance or worn or loose bearings.
  - Correct the oil leak concern.
  - Install a new spark plug.



3. Inspect for carbon fouling. Look for black, dry, fluffy carbon deposits on the insulator tips, exposed shell surfaces and electrodes, caused by a spark plug with an incorrect heat range, dirty air cleaner, too rich a fuel mixture or excessive idling.
  - Install new spark plugs.

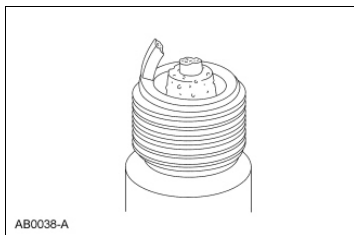


4. Inspect for normal burning.
  - Check for light tan or gray deposits on the firing tip.



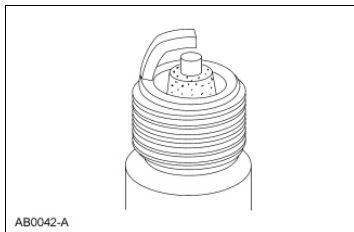
5. Inspect for pre-ignition, identified by melted electrodes and a possibly damaged insulator. Metallic deposits on the insulator indicate engine damage. This may be caused by incorrect ignition timing, wrong type of fuel or the unauthorized installation of a heli-coil insert in place of the spark plug threads.

- Install a new spark plug.



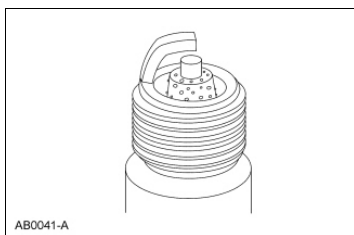
6. Inspect for overheating, identified by white or light gray spots and a bluish-burnt appearance of electrodes. This is caused by engine overheating, wrong type of fuel, loose spark plugs, spark plugs with an incorrect heat range, low fuel pump pressure or incorrect ignition timing.

- Install a new spark plug.



7. Inspect for fused deposits, identified by melted or spotty deposits resembling bubbles or blisters. These are caused by sudden acceleration.

- Install new spark plugs.








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**Exhaust Manifold Cleaning and Inspection**

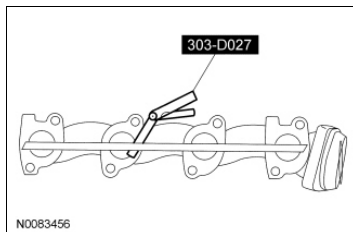
## Special Tool(s)

	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
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1. Clean the exhaust manifold using a suitable solvent. Use a plastic scraping tool to clean the gasket sealing surfaces.
2. **NOTE:** New exhaust manifold gaskets, studs, nuts and/or bolts must be installed when an exhaust manifold is serviced.

**NOTE:** Use a Straightedge that is calibrated by the manufacturer to be flat within 0.005 mm (0.0002 in) per running foot of length, such as Snap-On® GA438A or equivalent. For example, if the Straightedge is 61 cm (24 in) long, the machined edge must be flat within 0.010 mm (0.0004 in) from end to end.

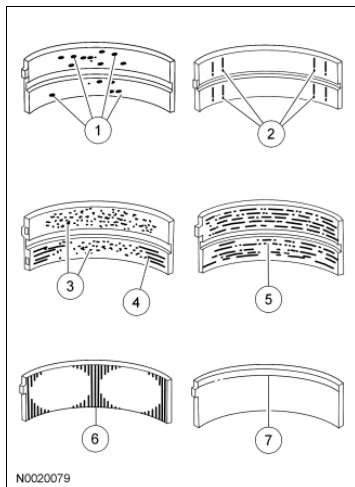
Using the Straightedge and a Feeler Gauge Set, check the exhaust manifold sealing surface for warpage. If the warpage is greater than 0.76 mm (0.0299 in), install a new exhaust manifold.





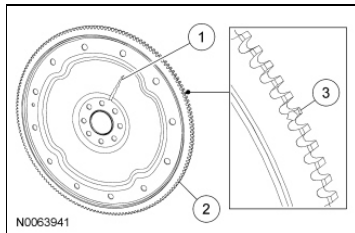
## Bearing Inspection

1. Inspect bearings for the following defects:
  1. Cratering - fatigue failure
  2. Spot polishing - incorrect seating
  3. Imbedded dirty engine oil
  4. Scratching - dirty engine oil
  5. Base exposed - poor lubrication
  6. Both edges worn - journal damaged
  7. One edge worn - journal tapered or bearing not seated



## Flexplate Inspection

1. Inspect the flexplate for:
  1. any cracks.
  2. worn ring gear teeth.
  3. chipped or cracked ring gear teeth.



## Powertrain/Drivetrain Mount Neutralizing

**NOTE:** Refer to the appropriate section and procedure for special instructions on loosening and tightening mount fasteners.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .
2. Loosen, but do not remove, the powertrain/drivetrain mount fasteners.
3. Lower the vehicle.
4. **NOTICE: Do not twist or strain the powertrain/drivetrain mounts or damage to the mounts may occur.**

Start the vehicle and move it in forward 0.6-1.2 m (2-4 ft). Then move the vehicle in reverse the same distance.

5. Raise and support the vehicle.
  6. Tighten the powertrain/drivetrain mount fasteners.
  7. Lower the vehicle.
  8. Test the system for normal operation.
-

## Material

Item	Specification	Fill Capacity
Gasket Maker TA-16	WSK-M2G348-A5	-
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	5.9L (6.2 qt) includes filter change
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Silicone Gasket Remover ZC-30	-	-

## General Specifications

Item	Specification
<b>Engine</b>	
Displacement	4.6L (281 CID) (2V)
No. cylinders	8
Bore	90.2 mm (3.5512 in)
Stroke	90 mm (3.5433 in)

Firing order	1-3-7-2-6-5-4-8
Oil pressure hot @ 2,500 rpm	40-70 psi
Compression ratio	9.37:1
Engine weight (without accessory drive components and flexplate)	233.1 kg (514 lb)
<b>Cylinder Head and Valve Train</b>	
Combustion chamber volume	43.95 ± 1.5 cc (2.68 ± 0.092 ci)
Valve arrangement (front to rear) LH	EIEIEIEI
Valve arrangement (front to rear) RH	IEIEIEIE
Valve guide bore diameter	7.044-7.015 mm (0.2773-0.2762 in)
Valve stem diameter (intake)	6.995-6.975 mm (0.2753-0.2746 in)
Valve stem diameter (exhaust)	6.970-6.949 mm (0.2744-0.2735 in)
Valve stem-to-guide clearance (intake)	0.069-0.020 mm (0.0027-0.0007 in)
Valve stem-to-guide clearance (exhaust)	0.095-0.046 mm (0.0037-0.0018 in)
Valve head diameter (intake)	44.6 mm (1.7559 in)
Valve head diameter (exhaust)	36.1 mm (1.4212 in)
Valve face runout limit	0.05 mm (0.0019 in)
Valve face angle	45.5°
Valve seat width (intake)	2.1-1.9 mm (0.0827-0.0748 in)
Valve seat width (exhaust)	2.1-1.9 mm (0.0827-0.0748 in)
Valve seat runout Total Indicated Runout (TIR)	0.025 mm (0.0009 in)
Valve seat angle	45.00°
Valve spring free length (intake)	50.2 mm (1.9763 in)
Valve spring free length (exhaust)	50.2 mm (1.9763 in)
Valve spring out-of-square limit (intake)	2.5°
Valve spring out-of-square limit (exhaust)	2.5°
Valve spring compression pressure (intake)	633.3-701.3 N @ 28.02 mm (1.1031 in)
Valve spring compression pressure (exhaust)	633.3-701.3 N @ 28.02 mm (1.1031 in)
Valve spring installed height (intake)	40.6-43.6 mm (1.5984-1.7165 in)
Valve spring installed height (exhaust)	40.6-43.6 mm (1.5984-1.7165 in)
Valve spring installed pressure (intake)	272.1-306.1 N @ 40.0 mm (1.5748 in)
Valve spring installed pressure (exhaust)	272.1-306.1 N @ 40.0 mm (1.5748 in)
Valve spring installed pressure service limit (intake)	274.6 N @ 40.01 mm (1.5752 in)
Valve spring installed pressure service limit (exhaust)	274.6 N @ 40-01 mm (1.5752 in)
Roller follower ratio	1.75:1
Head gasket surface flatness	0.025 mm (0.001 in) in any 25 mm (1 in) x 25 mm (1 in) area; 0.050 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.1 mm (0.004 in) overall
<b>Hydraulic Lash Adjuster</b>	
Diameter	15.988-16.00 mm (0.6294-0.6299 in)



Clearance to bore	0.018-0.069 mm (0.0007-0.0027 in)
Service limit	0.016 mm (0.0006 in)
Hydraulic leakdown rate	5-25 seconds
Collapsed lash adjuster gap	0.45-0.85 mm (0.0177-0.0334 in)
<b>Camshaft</b>	
Theoretical valve lift @ zero lash (intake)	12.0 mm (0.4724 in)
Theoretical valve lift @ zero lash (exhaust)	12.0 mm (0.4724 in)
Lobe lift (exhaust) (LH)	7.4974 mm (0.2951 in)
Lobe lift (exhaust) (RH)	7.4979 mm (0.2952 in)
Lobe lift (intake)	7.1103 mm (0.2799 in)
Allowable lobe lift loss	0
Journal diameter	26.96-26.93 mm (1.0615-1.0605 in)
Journal bore inside diameter (cap assembled)	27.01-26.99 mm (1.0635-1.0625 in)
Camshaft journal-to-bearing clearance	0.076-0.025 mm (0.0030-0.0010 in)
Runout: Full indicator measurement on all journals when supported on front and rear journal	0.09 mm (0.0035 in) (4 places)
Camshaft end play	0.03-0.19 mm (0.0011-0.0075 in)
<b>Cylinder Block</b>	
Cylinder bore diameter	90.200-90.213 (Grade 1)
Cylinder bore diameter	90.213-90.226 (Grade 2)
Cylinder bore diameter	90.226-90.239 (Grade 3)
Cylinder bore maximum taper	0.013 mm (0.00051 in)
Cylinder bore maximum out-of-round	0.015 mm (0.00059 in)
Main bearing bore inside diameter	72.40-72.424 mm (2.8504-2.8513 in)
Head gasket surface flatness	0.03 mm (0.001 in) in any 40 mm (1.5 in) x 40 mm (1.5 in) area; 0.05 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.15 mm (0.006 in) overall
<b>Crankshaft</b>	
Main bearing journal diameter	67.483-67.503 mm (2.6568-2.6576 in)
Main bearing journal maximum taper	0.004 mm (0.0002 in)
Main bearing journal maximum-out-of-round	0.0075 mm (0.0003 in) between cross sections
Main bearing journal-to-cylinder block clearance	0.066-0.024 mm (0.0259-0.0009 in)
Connecting rod journal diameter	53.003-52.983 mm (2.0867-2.0859 in)
Connecting rod journal maximum taper (straightness)	0.004 mm (0.0002 in)
Connecting rod journal maximum-out-of-round	0.0075 mm (0.0003 in) between cross sections
Crankshaft maximum end play	0.301 mm (0.0118 in)
<b>Piston and Connecting Rod</b>	
Piston diameter	
Grade 1	90.191-90.206 mm (3.5508-3.5514 in)
Grade 2	90.203-90.220 mm (3.5513-3.5519 in)
Grade 3	90.217-90.232 mm (3.5518-3.5524 in)

Piston-to-cylinder bore clearance (at grade size)	0.017-0.047 mm (0.0007-0.0019 in)
Piston ring end gap (top)	0.15-0.30 mm (0.0059-0.0118 in)
Piston ring end gap (intermediate)	0.15-0.30 mm (0.0059-0.0118 in)
Piston ring end gap (oil control)	0.15-0.30 mm (0.0059-0.0118 in)
Ring groove width (top)	1.520-1.540 mm (0.0598-0.0606 in)
Ring groove width (intermediate)	1.520-1.540 mm (0.0598-0.0606 in)
Ring groove width (oil control)	3.03-3.055 mm (0.1193-0.1203 in)
Piston ring width (top)	1.5 mm (0.05 in)
Piston ring width (intermediate)	1.5 mm (0.05 in)
Piston ring-to-groove clearance (top)	0.020-0.060 mm (0.0008-0.0024 in)
Piston ring-to-groove clearance (intermediate)	0.020-0.060 mm (0.0008-0.0023 in)
Piston ring-to-groove clearance (oil control)	0.030-0.070 mm (0.0012-0.0028 in)
Piston pin bore diameter	22.0065-22.0110 mm (0.8664-0.8666 in)
Piston pin diameter	21.995-21.997 mm (0.8659-0.8660 in)
Piston pin length	61.870-62.120 mm (2.4358-2.4456 in)
Piston pin-to-piston fit	0.0095-0.016 mm (0.0004-0.0006 in)
Piston-to-connecting rod clearance	6.58-7.58 mm (0.259-0.298 in)
Connecting rod-to-pin clearance	0.016-0.038 mm (0.0006-0.0015 in)
Connecting rod pin bore diameter	22.02-22.01 mm (0.8671-0.8666 in)
Connecting rod length (centerline bore-to-bore)	150.7 mm (5.9330 in)
Connecting rod maximum allowable bend	±0.038 mm (0.0015 in)
Connecting rod maximum allowable twist	±0.05 mm (0.0019 in)
Connecting rod bearing bore diameter	56.86-56.89 mm (2.2388-2.2396 in)
Connecting rod bearing-to-crankshaft clearance	0.06-0.02 mm (0.0026-0.0010 in)
Connecting rod side clearance (standard)	0.015-0.45 mm (0.0006-0.0177 in)
Connecting rod side clearance (maximum)	0.50 mm (0.0197 in)

### Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor stud bolts	25	18	-
Accessory drive idler pulley bolt	25	18	-
Camshaft bearing cap bolts <sup>a</sup>	-	-	-
Camshaft sprocket bolt <sup>a</sup>	-	-	-
Catalytic converter-to-exhaust manifold nut	48	35	-
Connecting rod bearing cap bolts <sup>a</sup>	-	-	-
Coolant bypass tube stud bolt	25	18	-
Coolant outlet adapter bolts	25	18	-
Coolant pump bolts	25	18	-

Coolant pump pulley bolts	25	18	-
Crankshaft main bearing cap bolts <sup>a</sup>	-	-	-
Crankshaft pulley bolt <sup>a</sup>	-	-	-
Crankshaft rear seal retainer plate bolts <sup>a</sup>	-	-	-
Cylinder head bolt <sup>a</sup>	-	-	-
Engine block coolant drain plug	20	-	177
Engine front cover <sup>a</sup>	-	-	-
Engine mount bolts	70	52	-
Engine mount nuts	90	66	-
Engine Oil Pressure (EOP) switch <sup>a</sup>	-	-	-
EGR tube	43	32	-
Exhaust manifold heat shield bolts	10	-	89
Exhaust manifold nuts <sup>a</sup>	-	-	-
Exhaust manifold studs	12	-	106
Flexplate bolts <sup>a</sup>	-	-	-
Generator battery cable nut	9	-	80
Generator bolts	25	18	-
Generator bracket bolts	10	-	89
Ground strap nut	10	-	89
Ground strap-to-RH cylinder head stud bolt	25	18	-
Ground strap bolt	10	-	89
Heated Oxygen Sensor (HO2S) <sup>a</sup>	-	-	-
Ignition coil bolts	6	-	53
Intake manifold bolts <sup>a</sup>	-	-	-
Intake manifold crash bracket bolts	25	18	-
Intake manifold shield bolts	10	-	89
Intermediate steering shaft pinch bolt	30	22	-
Jackscrews <sup>a</sup>	-	-	-
Knock Sensor (KS) nut	20	-	177
Oil cooler mounting bolt	46	34	-
Oil filter adapter bolts <sup>a</sup>	-	-	-
Oil level indicator tube bolt	10	-	89
Oil pan bolts <sup>a</sup>	-	-	-
Oil pan drain plug	23	17	-
Oil pump bolts	10	-	89
Oil pump screen and pickup tube-to-oil pump bolts	10	-	89
Oil pump screen and pickup tube spacer	25	18	-
Oil pump screen and pickup tube-to-spacer bolt	25	18	-
Power steering pump bolts	25	18	-
Power steering tube bracket nut	10	-	89
Shield bolts	25	18	-
Spark plugs	18	-	159
Support bracket nuts	10	-	89
Timing chain guide bolts	10	-	89

Timing chain tensioner bolts	25	18	-
Torque converter inspection cover bolts	19	-	168
Torque converter nuts	36	27	-
Transmission bellhousing bolts	48	35	-
Transmission cooler tube bracket bolt	15	-	133
Transmission cooler tube bracket nut	9	-	80
Transmission mount insulator bolts	90	66	-
Transmission mount insulator nuts	30	22	-
Valve cover studs and bolts <sup>a</sup>	-	-	-

<sup>a</sup> Refer to the procedure in this section.

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## Engine

**NOTE:** For information, refer to the exploded view under the Assembly procedure in this section.

The 4.6L (281 CID) is a V-8 engine with the following features:

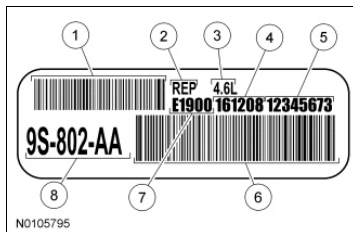
- Single overhead camshafts
- Two valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder heads
- Cast iron, 90-degree V-cylinder block
- Individually chain-driven camshafts with a hydraulic timing chain tensioner on each timing chain
- Electronic ignition system with 8 ignition coils
- Electronic returnless fuel system

## Engine Identification

Always refer to these labels when installation of new parts is necessary or when checking engine calibrations. The engine parts often differ within a CID family. Verification of the identification codes will make sure that the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions.

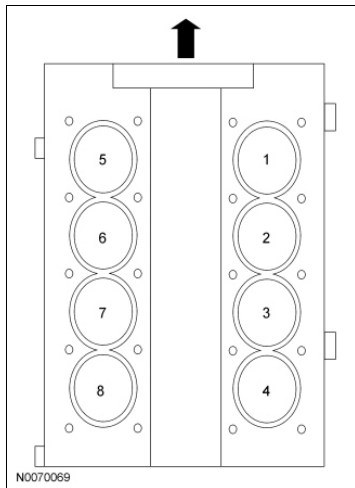
### Engine Code Information Label

The engine code information label, located on the side of the valve cover, contains the following:



Item	Description
1	Bar code
2	Engine plant (Romeo)
3	Engine displacement
4	Engine build date (DDMMYY)
5	Running number
6	Bar code
7	Plant shift line
8	Engine part number

## Engine Cylinder Identification



## Exhaust Emission Control System

Operation and necessary maintenance of the exhaust emission control devices used on this engine are covered in the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

## Induction System

The SFI provides the fuel/air mixture needed for combustion in the cylinders. The 8 solenoid-operated fuel injectors:

- are mounted in the intake manifold.
- meter fuel into the air intake stream in accordance with engine demand.
- are positioned so that their tips direct fuel just ahead of the engine intake valves.
- are connected in series with the fuel pressure sensor.

A constant fuel pressure is maintained across the fuel injectors by the fuel pressure sensor. The fuel pressure sensor:

- is positioned upstream from the fuel injectors on the fuel rail.

## Valve Train

The valve train operates as follows:

- Ball-tip hydraulic lash adjusters provide automatic lash adjustment.
- Roller followers ride on the camshaft lobe, transferring the up-and-down motion of the camshafts to the valves in the cylinder heads.

## PCV System

All engines are equipped with a closed-type PCV system recycling the crankcase vapors to the upper intake manifold.

## Lubrication System

The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the left front side of the cylinder block.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to both cylinder heads.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston ring assembly.
- The left cylinder head is fed from a drilling into the supply passage feeding the main gallery at the front of the cylinder block. The right cylinder head is fed from a drilling into the rear of the main gallery. Main gallery pressure is reduced as it enters the cylinder head galleries through fixed serviceable orifices, located at the upper part of the feed passages. It is this reduced pressure in the cylinder head galleries which feeds the camshaft journals, the hydraulic lash adjusters and the primary and secondary timing chain tensioners.
- The camshaft lobe and roller followers are lubricated by splash created through valve train operation.

## Oil Pump

The lubrication system of the 4.6L (2V) engine is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The heart of the system is a positive displacement internal gear oil pump using top seal rotors. Generically this design is known as a gerotor pump, which operates as follows:

- The oil pump is mounted on the front face of the cylinder block.
  - The inner rotor is piloted on the crankshaft post and is driven through flats on the crankshaft.
  - System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the oil pump.
  - Oil pump displacement has been selected to provide adequate volume to make sure of correct oil pressure, both at hot idle and maximum speed.
  - The relief valve calibration protects the system from excessive pressure during high viscosity conditions.
  - The relief valve is designed to provide adequate connecting rod bearing lubrication under high-temperature and high-speed conditions.
-

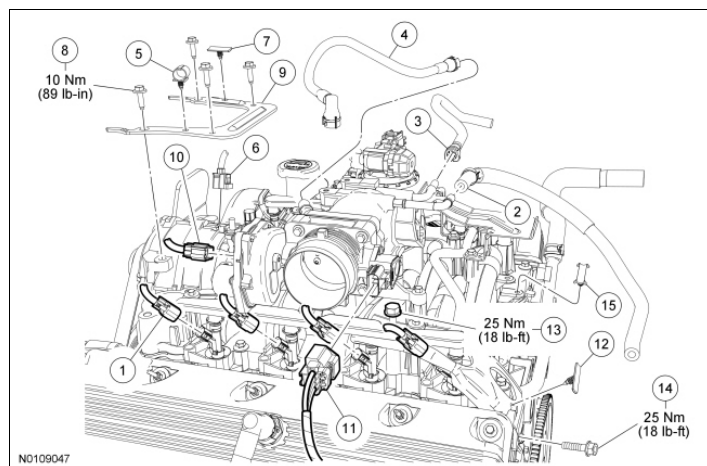




## **Engine**

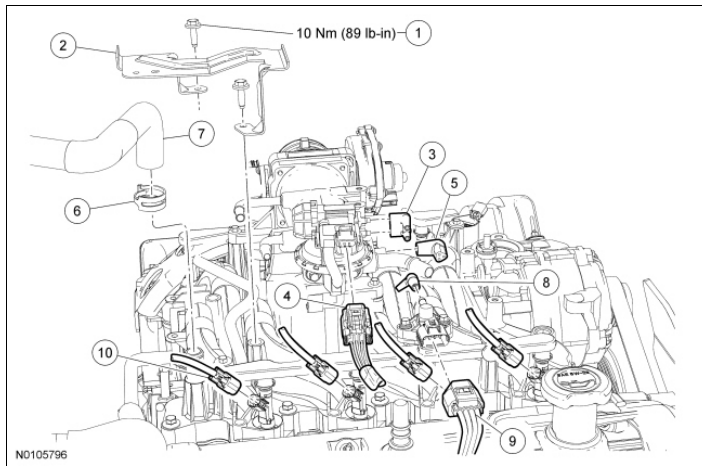
Refer to Section 303-00 for basic mechanical concerns or refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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**Intake Manifold****Intake Manifold (View 1 of 3)**

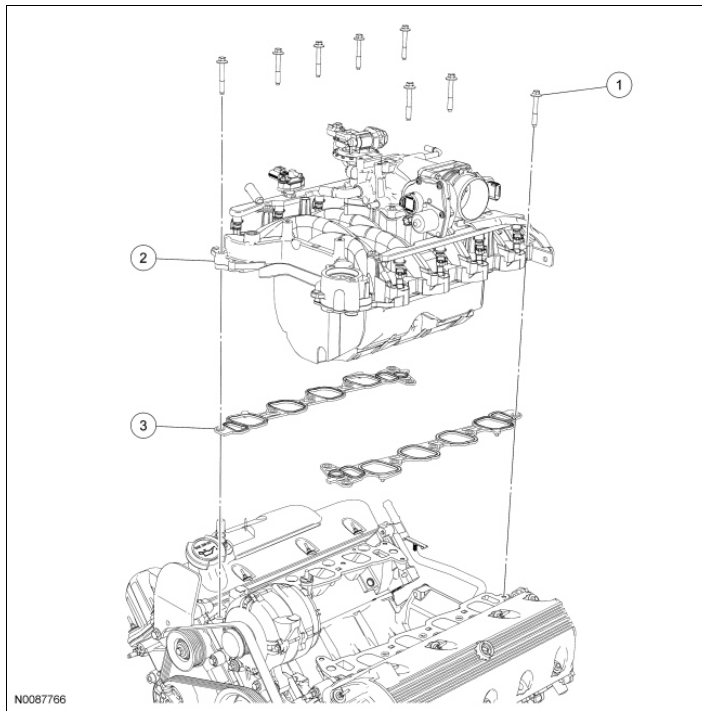
Item	Part Number	Description
1	14A464	Fuel injector electrical connector (part of 12B637) (4 required)
2	9C490	Brake booster vacuum hose
3	9D289	Evaporative Emission (EVAP) canister purge valve tube
4	6K817	PCV tube
5	-	Generator wiring harness retainer
6	14A464	Generator electrical connector (part of 12B637)
7	-	Generator B+ wiring harness retainer
8	N807309	Generator bracket bolt (4 required)
9	10153	Generator bracket
10	14A464	Throttle control electrical connector (part of 12B637)
11	14A464	Throttle Position (TP) sensor electrical connector (part of 12B637)
12	13A506	Wire harness retainer
13	W705793	Intake manifold crash bracket bolt
14	W701725	Intake manifold crash bracket bolt
15	13A506	Wire harness retainer

**Intake Manifold (View 2 of 3)**



Item	Part Number	Description
1	N807309	Intake manifold shield bolt (2 required)
2	9F460	Intake manifold shield
3	9E489	EGR system module vacuum connector
4	14A464	EGR system module electrical connector (part of 12B637)
5	9E499	Intake manifold vacuum hose connector
6	15161	Heater hose spring clamp
7	18D334	Heater hose
8	9E489	Fuel rail pressure and temperature sensor vacuum connector
9	14A464	Fuel rail pressure and temperature sensor electrical connector (part of 12B637)
10	14A464	Fuel injector electrical connector (part of 12B637) (4 required)

#### Intake Manifold (View 3 of 3)



Item	Part Number	Description
1	W503301	Intake manifold bolt (8 required)
2	9424	Intake manifold
3	9439	Intake manifold gasket (2 required)

### Removal

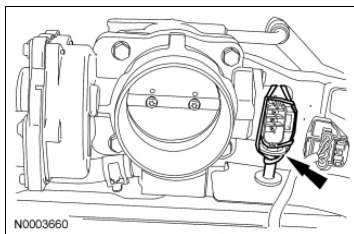
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the fuel tube spring lock coupling. For additional information, refer to [Section 310-00](#) .
3. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
4. Drain the engine cooling system. For additional information, refer to [Section 303-03](#) .
5. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to [Section 303-12](#) .
6. Remove the wiper mounting arm and pivot shaft. For additional information, refer to [Section 501-16](#) .
7. Disconnect the 8 fuel injector electrical connectors.
8. Remove the 8 ignition coil-on-plugs. For additional information, refer to [Section 303-07](#) .
9. Remove the 2 bolts and the intake manifold shield.
10. Disconnect the brake booster vacuum hose from the intake manifold.
11. Disconnect the quick connect coupling Evaporative Emission (EVAP) canister purge valve hoses

from the Throttle Body (TB) spacer and from the EVAP canister purge valve. For additional information, refer to [Section 310-00](#).

12. Disconnect the quick connect coupling PCV tube from the TB spacer. For additional information, refer to [Section 310-00](#).
13. Disconnect the EGR system module vacuum and electrical connectors.
14. Disconnect the intake manifold-to- TB spacer vacuum hose.
15. Disconnect the generator electrical connector.
16. Detach the 2 generator wiring harness retainers from the generator bracket.
17. Remove the 4 generator bracket bolts and the bracket.
18. Remove the coolant thermostat. For additional information, refer to [Section 303-03](#).
19. Disconnect the throttle control and the Throttle Position (TP) sensor electrical connectors.
20. Release the heater hose spring clamp and disconnect the heater hose.
21. Remove the EGR system module tube. For additional information, refer to [Section 303-08](#).
22. If equipped, detach the wire harness retainer from the intake manifold crash bracket.
23. Remove the intake manifold crash bracket bolt and prevent the bolt from contacting the cylinder head with a rubber band or tie strap.

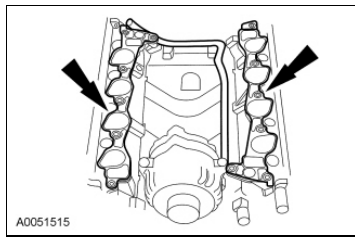


24. Remove the intake manifold crash bracket bolt.
25. Disconnect the fuel rail pressure and temperature sensor vacuum and electrical connectors.
26. Remove the wire harness retainer from the rear of the intake manifold.
27. Remove the 8 bolts and the intake manifold.
  - Remove and discard the intake manifold gaskets.
28. Clean the sealing surfaces.

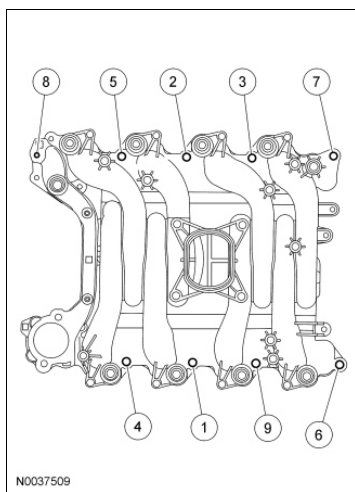
## Installation

1. **NOTE:** Align the gasket locator tabs with the slots in the cylinder head.


Install new intake manifold gaskets.



2. Install the intake manifold and hand-tighten the 8 bolts.
3. Install the 8 ignition coil-on-plugs. For additional information, refer to [Section 303-07](#).
4. Position the intake manifold crash bracket and loosely install the bolt and stud bolt.
5. Tighten the bolts in the sequence shown.
  - Tighten to 25 Nm (18 lb-ft).



6. Tighten the intake manifold crash bracket bolt.
  - Tighten to 25 Nm (18 lb-ft).
7. Install the EGR system module tube. For additional information, refer to [Section 303-08](#).
8. Install the intake manifold shield and the 2 bolts.
  - Tighten to 10 Nm (89 lb-in).
9. Connect the throttle control and the TP sensor electrical connectors.
10. Install the coolant thermostat. For additional information, refer to [Section 303-03](#).
11. Install the generator bracket and the 4 bracket bolts.
  - Tighten to 10 Nm (89 lb-in).
12. Connect the generator electrical connector.
13. Attach the 2 generator wiring harness retainers to the generator bracket.
14. Connect the EVAP canister purge valve hoses to the TB and the EVAP canister purge valve. For additional information, refer to [Section 310-00](#).
15. Connect the intake manifold vacuum hose to the TB spacer.

16. Connect the EGR system module vacuum and electrical connectors.
17. Connect the PCV tube quick connect coupling to the TB spacer. For additional information, refer to Section 310-00 .
18. Connect the brake booster vacuum hose to the intake manifold.
19. Install the heater hose and spring clamp.
20. Connect the fuel rail pressure and temperature sensor vacuum and electrical connectors.
21. Connect the 8 fuel injector electrical connectors.
22. Install the wire harness retainer to the rear of the intake manifold.
23. If equipped, attach the wire harness retainer to the intake manifold crash bracket.
24. Install the wiper mounting arm and pivot shaft. For additional information, refer to Section 501-16 .
25. Connect the fuel spring lock coupling. For additional information, refer to Section 310-00 .
26. Install the ACL and outlet pipe. For additional information, refer to Section 303-12 .
27. Connect the battery ground cable. For additional information, refer to Section 414-01 .
28. Fill and bleed the engine cooling system. For additional information, refer to Section 303-03 .
29.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

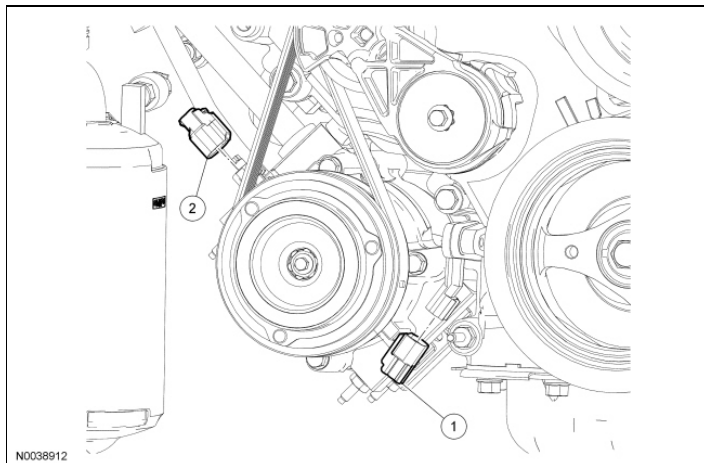
If equipped with a fire suppression system, repower the system.

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**Valve Cover - RH**

## Material

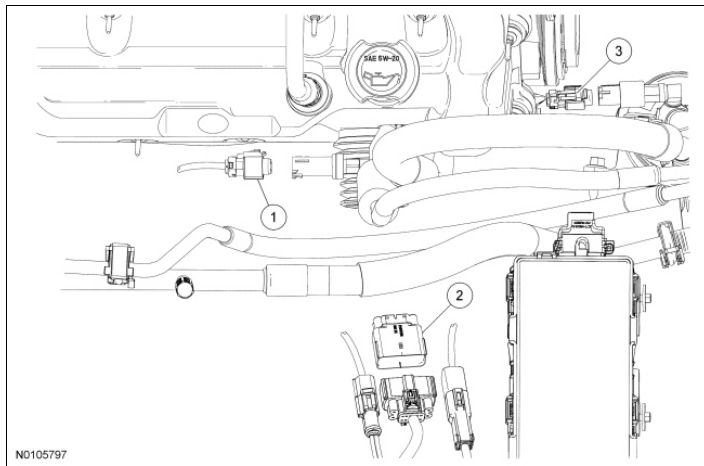
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-

**Valve Cover - RH (View 1 of 4)**

Item	Part Number	Description
1	14A464	Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
2	14A464	A/C compressor electrical connector (part of 12B637)

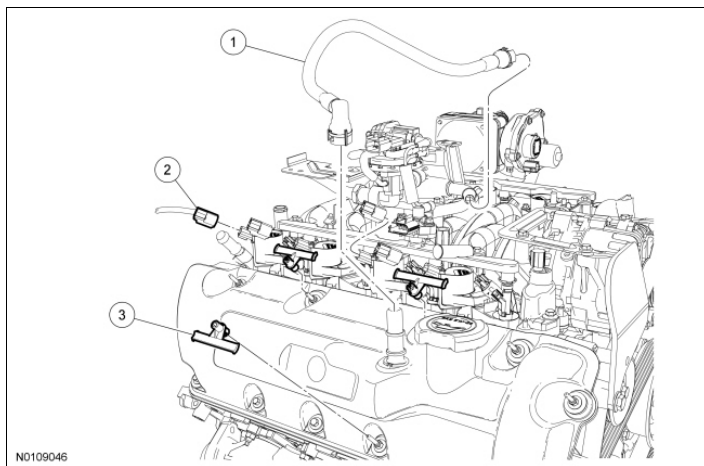
**Valve Cover - RH (View 2 of 4)**





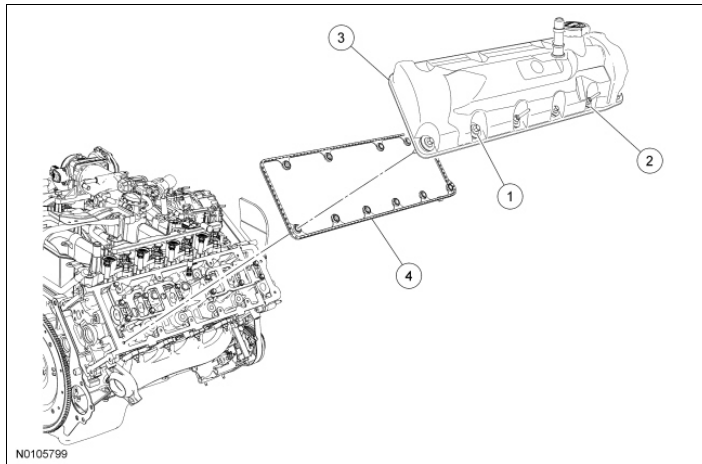
Item	Part Number	Description
1	14A464	A/C pressure sensor electrical connector (part of 12B637)
2	14A464	Electronic engine control electrical connector (part of 12B637)
3	14A464	A/C accumulator switch electrical connector (part of 12B637)

#### Valve Cover - RH (View 3 of 4)



Item	Part Number	Description
1	6K817	PCV tube
2	14A464	Ignition coil electrical connector (part of 12B637) (4 required)
3	14A163	Engine wire harness retainer (part of 12B637) (3 required)

## Valve Cover - RH (View 4 of 4)



Item	Part Number	Description
1	N806183	RH valve cover bolt (3 required)
2	W705644	RH valve cover stud bolt (8 required)
3	6582	RH valve cover
4	6584	RH valve cover gasket

**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the fuel tube spring lock coupling. For additional information, refer to [Section 310-00](#) .
3. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
4. Remove the LH engine mount. For additional information, refer to [Engine Mount - LH](#) in this section.
5. Remove the Evaporative Emission (EVAP) canister purge valve. For additional information, refer to [Section 303-13](#) .
6. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
7. Disconnect the A/C compressor electrical connector.
8. Disconnect the A/C pressure sensor electrical connector.
9. Disconnect the electronic engine control electrical connector.
10. Disconnect the A/C accumulator switch electrical connector.
11. Disconnect the PCV tube quick connect coupling from the PCV valve. For additional information, refer to [Section 310-00](#) .
12. Disconnect the 4 RH ignition coil electrical connectors.

13. Disconnect the 3 wire harness retainers from the valve cover and position wire harness aside.
14. Lower the engine.
15. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surface. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the gasket material.

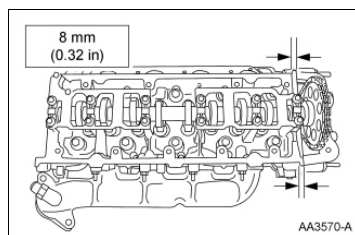
Loosen the 8 studs, the 3 bolts and remove the valve cover and discard the gasket.

- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Discard the valve cover gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

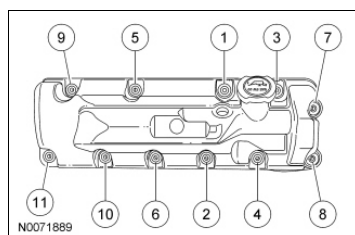
## Installation

1. **NOTICE:** If the valve cover is not installed and the fasteners tightened within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.


Apply a bead of silicone gasket and sealant in 2 locations shown where the engine front cover meets the cylinder head.



2. Install a new valve cover gasket and the valve cover.
  - Tighten the fasteners in the sequence shown to 10 Nm (89 lb-in).



3. Raise the engine.
4. Position wire harness and connect the 3 wire harness retainers to the valve cover.
5. Connect the 4 RH ignition coil electrical connectors.
6. Connect the PCV tube quick connect coupling to the PCV valve. For additional information, refer to Section 310-00.
7. Connect the A/C accumulator switch electrical connector.

8. Connect the 3 electronic engine control electrical connectors.
9. Connect the A/C pressure sensor electrical connector.
10. Connect the A/C compressor electrical connector.
11. Connect the CKP sensor electrical connector.
12. Install the EVAP canister purge valve. For additional information, refer to Section 303-13 .
13. Install the LH engine mount. For additional information, refer to Engine Mount - LH in this section.
14. Connect the fuel tube spring lock coupling. For additional information, refer to Section 310-00 .
15. Connect the battery ground cable. For additional information, refer to Section 414-01 .
16.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

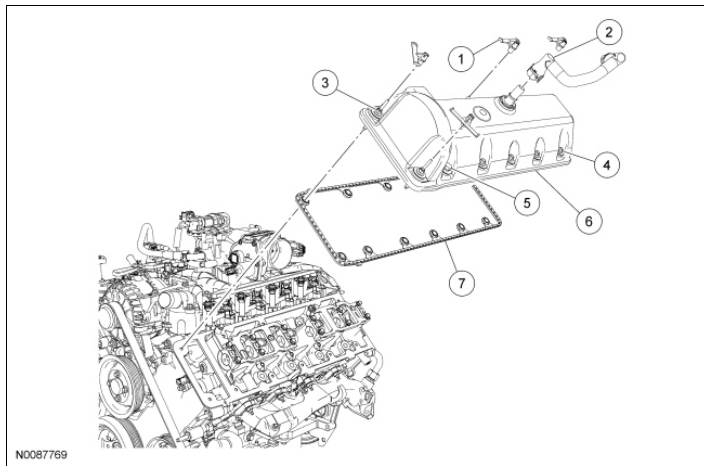
If equipped with a fire suppression system, repower the system.

---

**Valve Cover - LH**

## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-



Item	Part Number	Description
1	13A506	Wire harness retainer (part of 12B637) (4 required)
2	6758	Crankcase ventilation tube
3	W705644	Valve cover stud bolt (5 required)
4	N806183	Valve cover bolt (6 required)
5	W705787	Valve cover bolt
6	6A505	LH valve cover
7	6A559	LH valve cover gasket

**Removal**

1. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to [Section 303-12](#) .
2. Disconnect the 4 wiring harness retainers from the valve cover and position the wire harness aside.
3. Disconnect the crankcase ventilation tube quick connect coupling from the valve cover. For additional information, refer to [Section 310-00](#) .
4. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surface. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the gasket material.

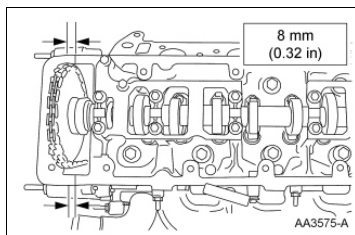
Loosen the 11 fasteners and remove the LH valve cover and gasket.

- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Discard the valve cover gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

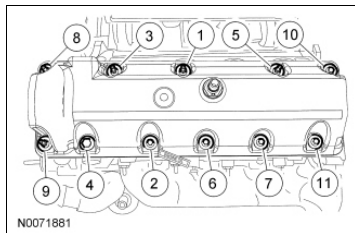
## Installation

1. **NOTICE:** If the valve cover is not installed and the fasteners tightened within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.

Apply a bead of silicone gasket and sealant in 2 locations shown where the engine front cover meets the cylinder head.

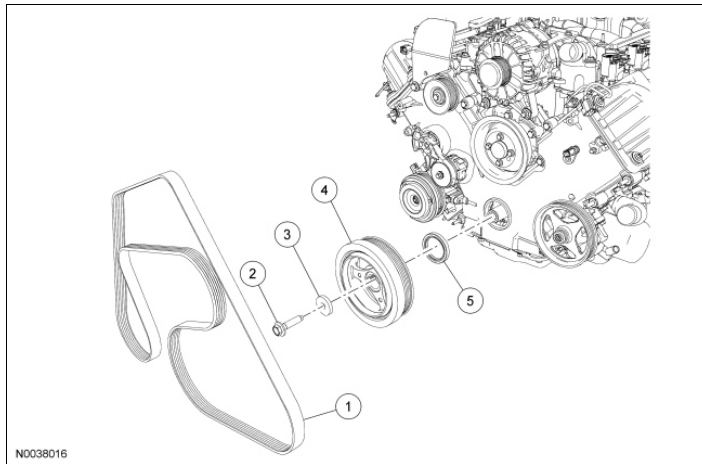


2. Position the LH valve cover and new gasket on the cylinder head.
  - Tighten the fasteners in the sequence shown to 10 Nm (89 lb-in).



3. Connect the crankcase ventilation tube quick connect coupling to the valve cover. For additional information, refer to [Section 310-00](#).
  4. Position the wire harness and connect the 4 wiring harness retainers to the valve cover.
  5. Install the ACL and outlet pipe. For additional information, refer to [Section 303-12](#).
-



**Lower End Components - Exploded View, Crankshaft Pulley and Crankshaft Front Seal**




Item	Part Number	Description
1	8620	Accessory drive belt
2	W701512	Crankshaft pulley bolt
3	N806165	Crankshaft pulley bolt washer
4	6316	Crankshaft pulley
5	6700	Crankshaft front seal

1. For additional information, refer to the procedures in this section.



## Crankshaft Pulley

### Special Tool(s)

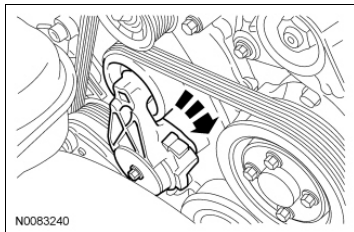
 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)
 ST1286-A	Remover, Crankshaft Vibration Damper 303-009 (T58P-6316-D)
 ST1438-A	Strap Wrench 303-D055 (D85L-6000-A) or equivalent

### Material

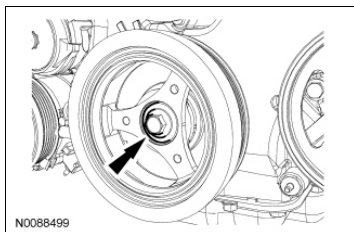
Item	Specification
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

### Removal

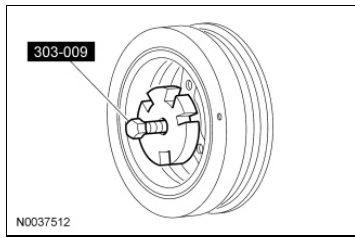
1. Remove the engine cooling fan motor and shroud. For additional information, refer to [Section 303-03](#).
2. Rotate the tensioner clockwise and remove the accessory drive belt.



3. Remove the crankshaft pulley bolt.



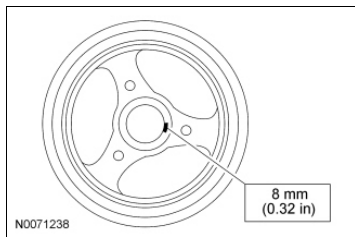
4. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley.



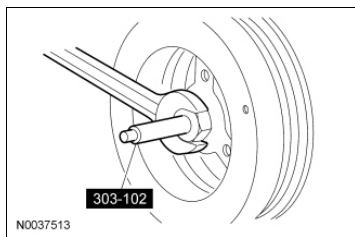
## Installation

1. **NOTE:** The crankshaft pulley must be installed within 4 minutes after applying the silicone.

Apply sealant to the Woodruff key slot on the crankshaft pulley.



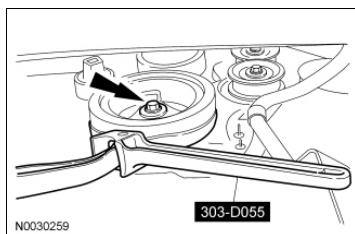
2. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.



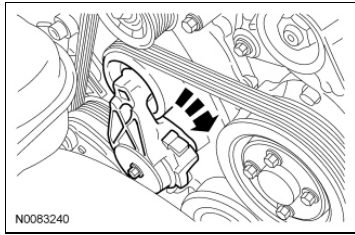
3. **NOTE:** Use the Strap Wrench to hold the crankshaft pulley.

Install the bolt and washer. Tighten the bolt in 4 steps.

- Step 1: Tighten to 120 Nm (89 lb-ft).
- Step 2: Loosen the bolt one full turn.
- Step 3: Tighten to 50 Nm (37 lb-ft).
- Step 4: Tighten an additional 90 degrees.




4. Rotate the tensioner clockwise and install the accessory drive belt.



5. Install the engine cooling fan motor and shroud. For additional information, refer to Section 303-03 .
-

**Crankshaft Front Seal****Special Tool(s)**

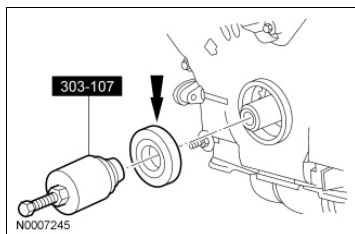
 ST2197-A	Installer, Crankshaft Front Oil Seal 303-635
 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST1288-A	Remover, Crankshaft Front Oil Seal 303-107 (T74P-6700-A)

**Material**

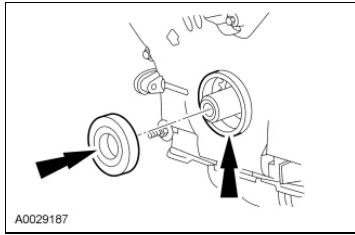
Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Removal**

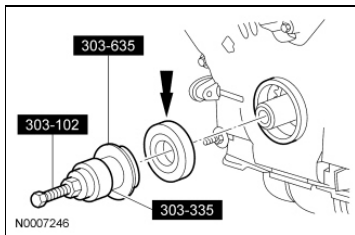
1. Remove the crankshaft pulley. For additional information, refer to [Crankshaft Pulley](#) in this section.
2. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft front seal.

**Installation**

1. Lubricate the engine front cover and the crankshaft front seal inner lip with clean engine oil.



2. Using the Crankshaft Front Oil Seal Installer, Crankshaft Vibration Damper Installer and Front Cover Oil Seal Installer, install the crankshaft front seal into the engine front cover.

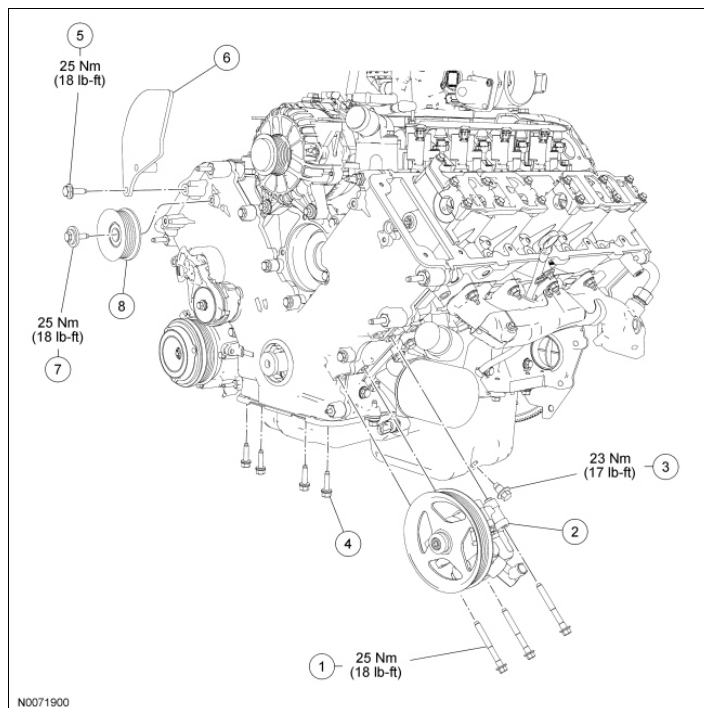


3. Install the crankshaft pulley. For additional information, refer to Crankshaft Pulley in this section.
-

**Engine Front Cover**

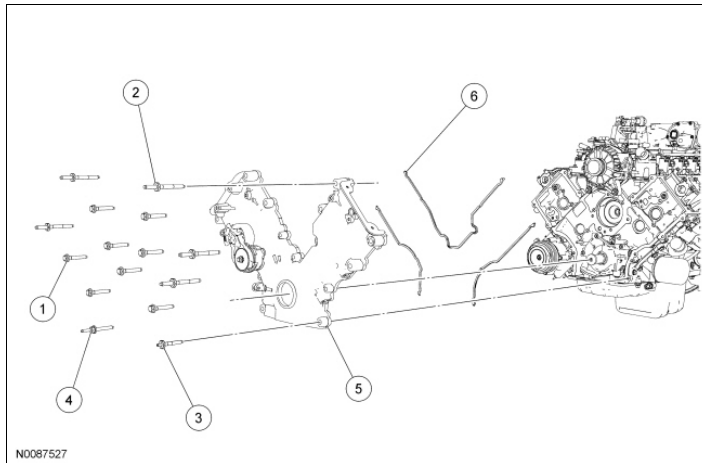
## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-

**Engine Front Cover (View 1 of 2)**

Item	Part Number	Description
1	W500315	Power steering pump bolt (3 required)
2	3A674	Power steering pump assembly

3	6730	Oil pan drain plug
4	W701605	Oil pan bolt (4 required)
5	W701725	Shield bolt
6	9G609	Shield
7	N808102	Accessory drive idler pulley bolt
8	19A216	Accessory drive idler pulley

**Engine Front Cover (View 2 of 2)**

Item	Part Number	Description
1	N806177	Engine front cover bolt (8 required)
2	N806300	Engine front cover stud bolt (5 required)
3	W706508	Engine front cover bolt
4	N808586	Engine front cover bolt
5	6D080	Engine front cover
6	6D081	Engine front cover gasket (3 required)

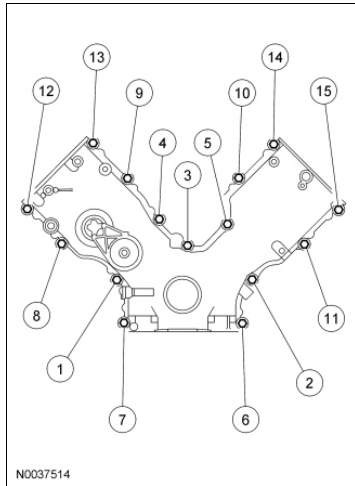
**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

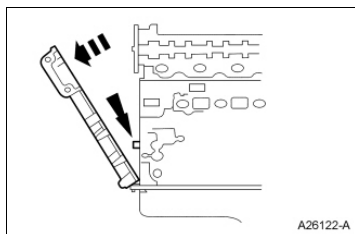
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Remove both valve covers. For additional information, refer to [Valve Cover - RH](#) or [Valve Cover - LH](#) in this section.
3. Remove the coolant pump. For additional information, refer to [Section 303-03](#) .
4. Remove the crankshaft front seal. For additional information, refer to [Crankshaft Front Seal](#) in this section.
5. Remove the 3 bolts and position the power steering pump aside.

6. Drain the engine oil.
  - Install the drain plug when finished.
  - Tighten to 23 Nm (17 lb-ft).
7. Remove the 4 front oil pan-to-engine front cover bolts.
8. Remove the bolt and the shield.
9. Remove the bolt and the accessory drive idler pulley.
10. Remove the bolts and the stud bolts in the sequence shown.



11. Remove the engine front cover from the front cover-to-cylinder block dowel.



12. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surface. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the gasket material.

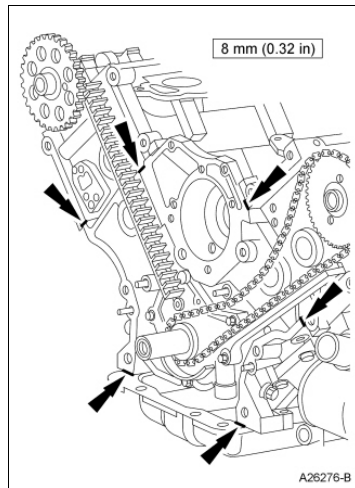
Clean the gasket surfaces with a plastic scraping tool and metal surface prep.

## Installation

1. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

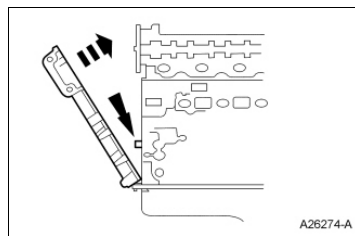
Apply silicone gasket and sealant along the cylinder head-to-block surface and the oil pan-to-cylinder block surface.





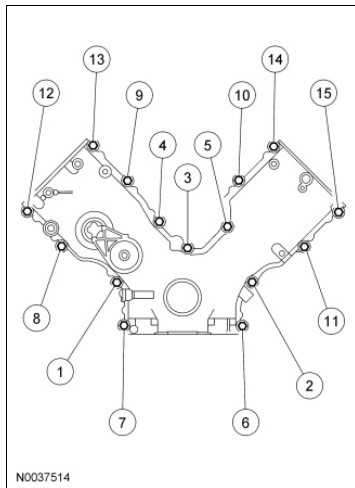
2. Position the new engine front cover gaskets.

3. Install the engine front cover on the front cover-to-cylinder block dowel and loosely install the bolts.



4. Tighten the front cover fasteners in the sequence shown to 25 Nm (18 lb-ft).

Item	Part Number	Description
1	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
2	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
3	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
4	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
5	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
6	W706508	Stud, hex-head pilot, M8 x 1.25 x 50 - M6 x 1 x 10
7	N808586	Stud, washer hex-head pilot, M8 x 1.25 - M6 x 1.0 x 86.35
8	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
9	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
10	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
11	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
12	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
13	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
14	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
15	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1



5. Install the accessory drive idler pulley and the bolt.
  - Tighten to 25 Nm (18 lb-ft).

6. Install the shield and the bolts.
  - Tighten to 25 Nm (18 lb-ft).

7. Loosely install the 4 front oil pan bolts.

8. **NOTE:** Make sure to tighten the bolts in 2 stages.

Tighten the 4 front oil pan bolts in 2 stages.

- Stage 1: Tighten to 20 Nm (177 lb-in).
- Stage 2: Tighten an additional 60 degrees.

9. **NOTE:** The front lower hole in the power steering pump is not used.

Position the power steering pump and install the 3 bolts.

- Tighten to 25 Nm (18 lb-ft).

10. Install a new crankshaft front seal. For additional information, refer to Crankshaft Front Seal in this section.

11. Install the coolant pump. For additional information, refer to Section 303-03.

12. Install the valve covers. For additional information, refer to Valve Cover - RH or Valve Cover - LH in this section.

13. Fill the engine with clean engine oil.





14. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B. Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



**Timing Drive Components**

## Special Tool(s)

	Aligner, Camshaft Position 303-557 (T96T-6256-B)
 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-581 (T97T-6565-A)
 ST1335-A	Holding Tool, Crankshaft 303-448 (T93P-6303-A)

## General Equipment

Hydraulic Chain Tensioner Clip - 1L3Z-6P250-AA

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

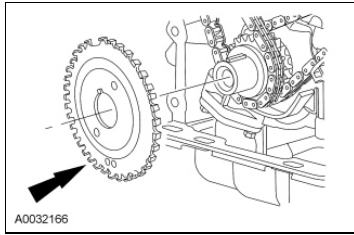
**Removal**

**NOTICE:** Since the engine is not free-wheeling, timing procedures must be followed exactly or piston and valve damage can occur.

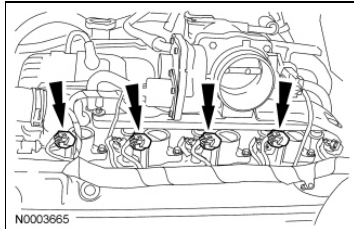
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

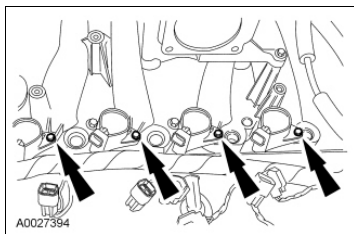
2. Remove the engine front cover. For additional information, refer to [Engine Front Cover](#) in this section.
3. Remove the crankshaft sensor ring from the crankshaft.



4. Disconnect the 8 ignition coil electrical connectors (4 shown).



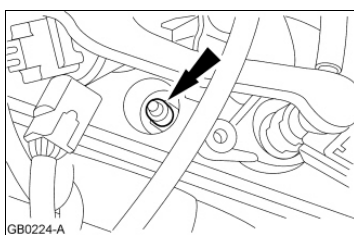
5. Remove the bolts and the 8 ignition coils (4 shown).



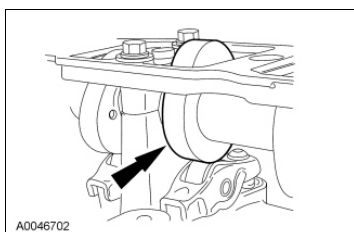
6. **NOTICE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.

**NOTE:** Use compressed air to remove any foreign material from the spark plug wells before removing the spark plugs.

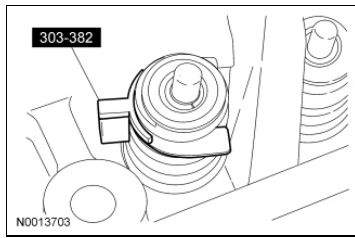
Remove the 8 spark plugs.



7. Position the lobe of the camshaft up.

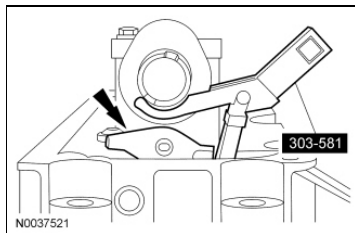


8. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.

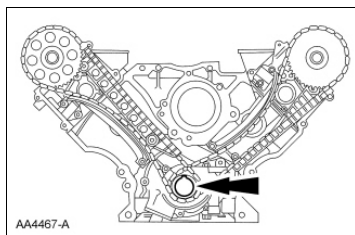


9. **NOTICE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.

Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller followers.



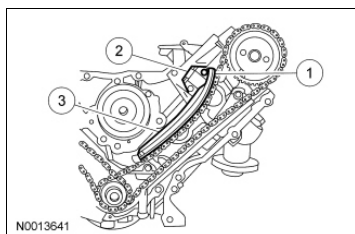
10. Position the crankshaft with the keyway at the 12 o'clock position.



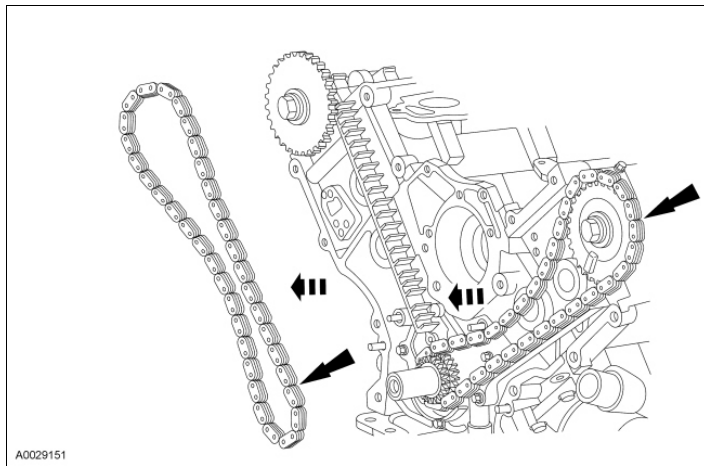
11. **NOTE:** LH shown, RH similar.

Remove the timing chain tensioning system from both timing chains.

1. Remove the bolts.
2. Remove the timing chain tensioners.
3. Remove the timing chain tensioner arms.

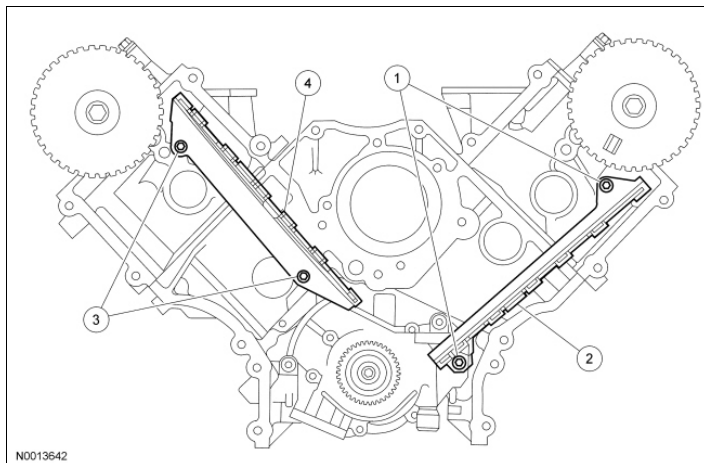


12. Remove the LH and RH timing chains and the crankshaft sprocket.
- Remove the RH timing chain from the camshaft sprocket.
  - Remove the RH timing chain from the crankshaft sprocket.
  - Repeat for the LH timing chain and crankshaft sprocket.



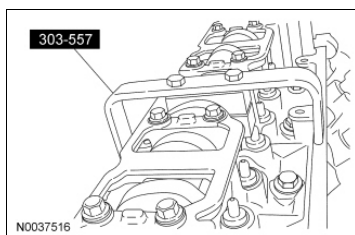
13. Remove the timing chain guides.

1. Remove the bolts.
2. Remove the LH timing chain guide.
3. Remove the bolts.
4. Remove the RH timing chain guide.



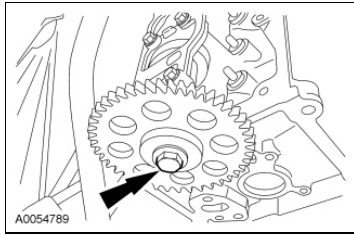
14. **NOTE:** RH shown, LH similar.

Install the Camshaft Position Aligner.



15. **NOTE:** RH shown, LH similar.

Remove the bolt and the camshaft gear.



## Installation

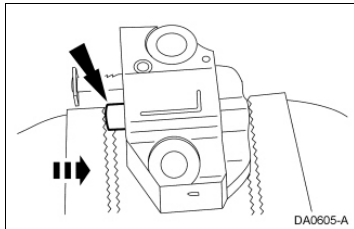
### Engines with ratcheting timing chain tensioners

1. **NOTICE:** Timing chain procedure must be followed exactly or damage to valves and pistons will result.

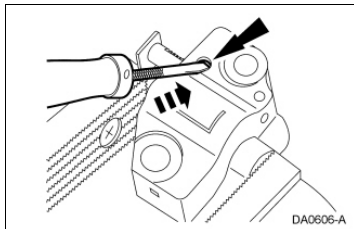
**NOTICE:** Do not compress the ratchet assembly. This will damage the ratchet assembly.

**NOTE:** LH shown, RH similar.

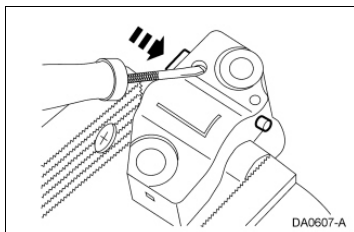
Compress each tensioner plunger, using an edge of a vise.



2. Using a small screwdriver or pick, push back and hold the ratchet mechanism.

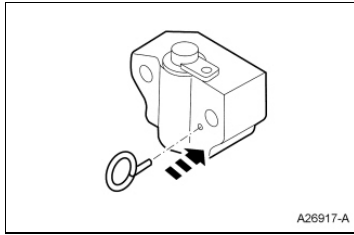


3. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.



4. Install a paper clip into the hole of each tensioner housing to hold the ratchet assembly and plunger in during installation.
  - Remove the tensioner from the vise.





### Engines with non-ratcheting timing chain tensioners

5. **NOTICE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

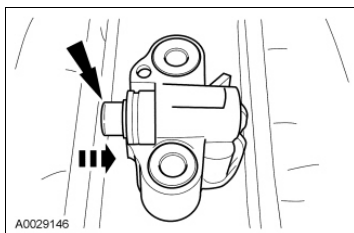
Inspect the RH and LH timing chain tensioners.

- Install new tensioners as necessary.

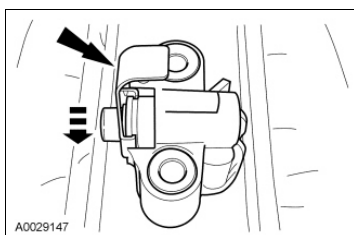
6. **NOTICE:** The timing chain procedure must be followed exactly or damage to valves and pistons will result.

**NOTE:** LH shown, RH similar.

Compress each tensioner plunger, using a vise.

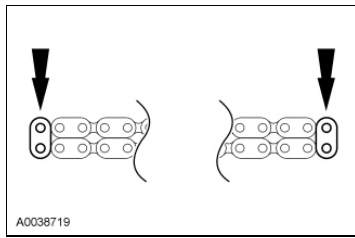


7. Install a Hydraulic Chain Tensioner Retaining Clip on each tensioner to hold the plunger in during installation.



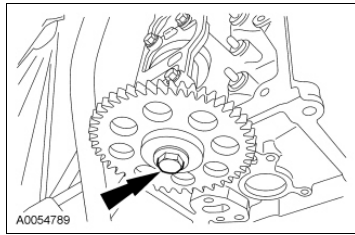
### All engines

8. If the colored links are not visible, mark one link on one end and one link on the other end, and use as timing marks.

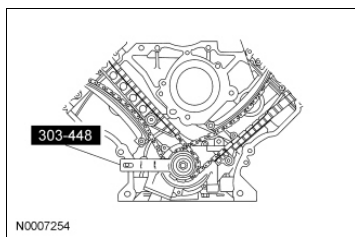


9. Install the camshaft sprockets and new bolts. Tighten the bolts in 2 stages.

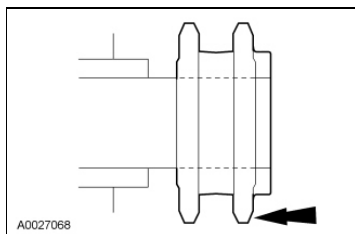
- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees (one-fourth turn).



10. Using the Crankshaft Holding Tool, position the crankshaft so the No. 1 cylinder is at Top Dead Center (TDC).

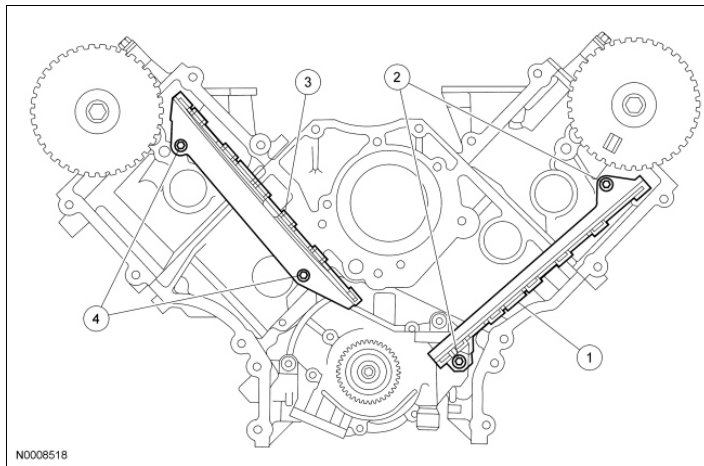


11. Install the crankshaft sprocket, making sure the flange faces forward.

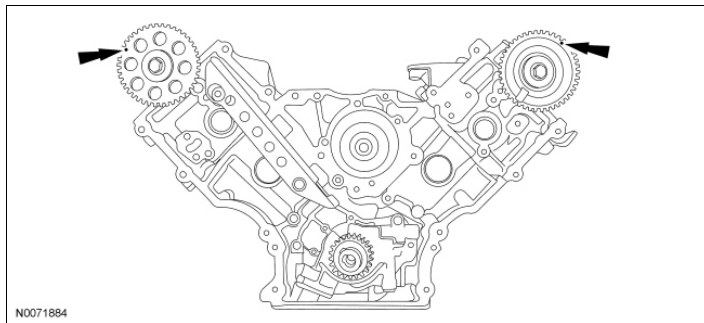


12. Install the timing chain guide.

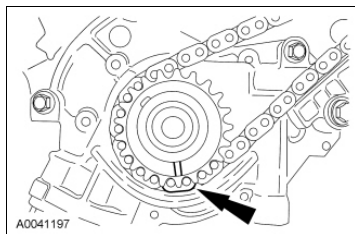
1. Position the LH timing chain guide.
2. Install and tighten the LH bolts to 10 Nm (89 lb-in).
3. Position the RH timing chain guide.
4. Install and tighten the RH bolts to 10 Nm (89 lb-in).



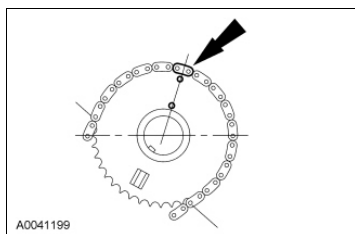
13. Rotate the RH camshaft sprocket until the timing mark is approximately at the 11 o'clock position.  
Rotate the LH camshaft sprocket until the timing mark is approximately at the 1 o'clock position.



14. Position the LH (inner) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



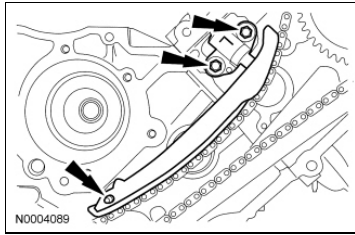
15. Install the LH timing chain on the sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



16. **NOTE:** The LH timing chain tensioner arm has a bump near the dowel hole for identification.

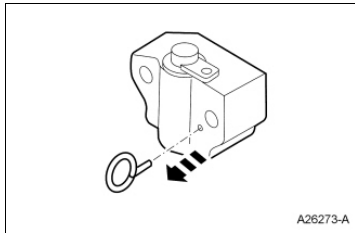
Position the LH timing chain tensioner arm on the dowel pin and install the LH timing chain tensioner.

- Tighten to 25 Nm (18 lb-ft).



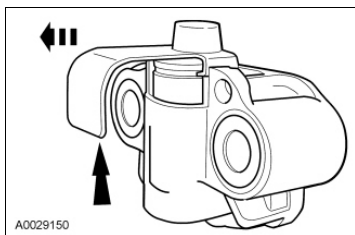
### Engines with ratcheting timing chain tensioners

17. Remove the paper clip from the LH timing chain tensioner.



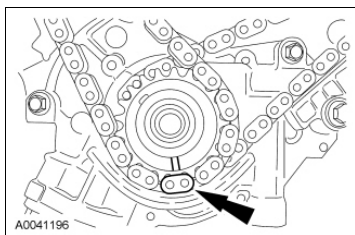
### Engines with non-ratcheting timing chain tensioners

18. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.

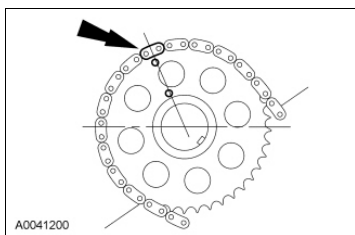


### All engines

19. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.

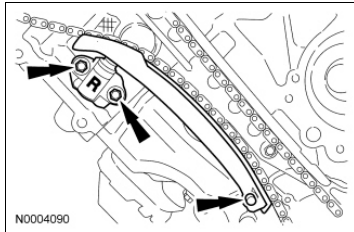


20. Install the RH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



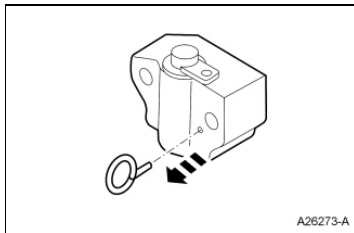
21. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner.

- Tighten to 25 Nm (18 lb-ft).



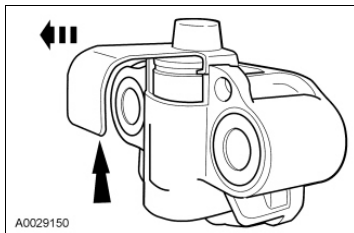
### Engines with ratcheting timing chain tensioners

22. Remove the paper clip from the RH timing chain tensioner.



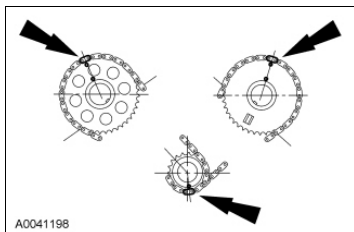
### Engines with non-ratcheting timing chain tensioners

23. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.

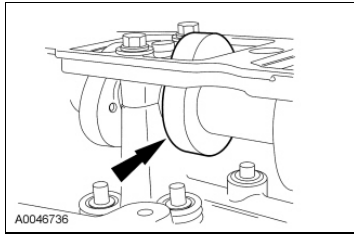


### All engines

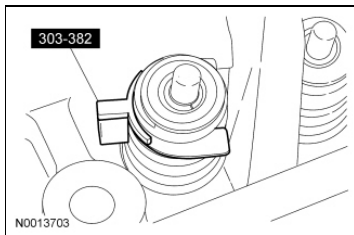
24. Make sure that the colored (marked) chain links are lined up with the dots on the crankshaft sprocket and the camshaft sprockets.



25. Rotate the camshaft until the lobe is in the up position.



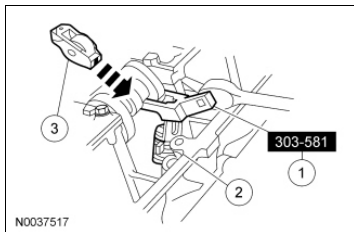
26. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



27. **NOTE:** Lubricate the camshaft roller followers using clean engine oil.

Install the camshaft roller followers.

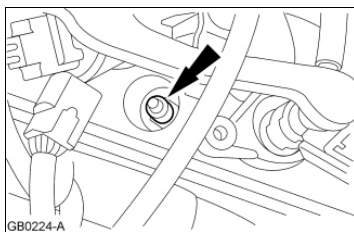
1. Install the Valve Spring Compressor.
2. Compress the valve spring.
3. Install the camshaft roller followers in their original locations.



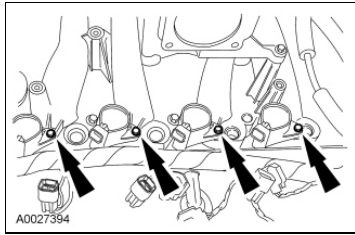
28. **NOTICE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.

Install the 8 spark plugs.

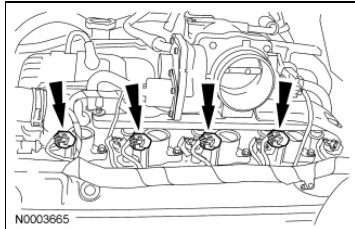
- Tighten to 18 Nm (159 lb-in).



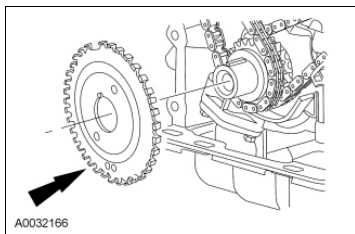
29. Install the 8 ignition coils and bolts (4 shown).
- Tighten to 6 Nm (53 lb-in).



30. Connect the 8 ignition coil electrical connectors (4 shown).



31. Install the crankshaft sensor ring on the crankshaft.



32. Install the engine front cover. For additional information, refer to Engine Front Cover in this section.

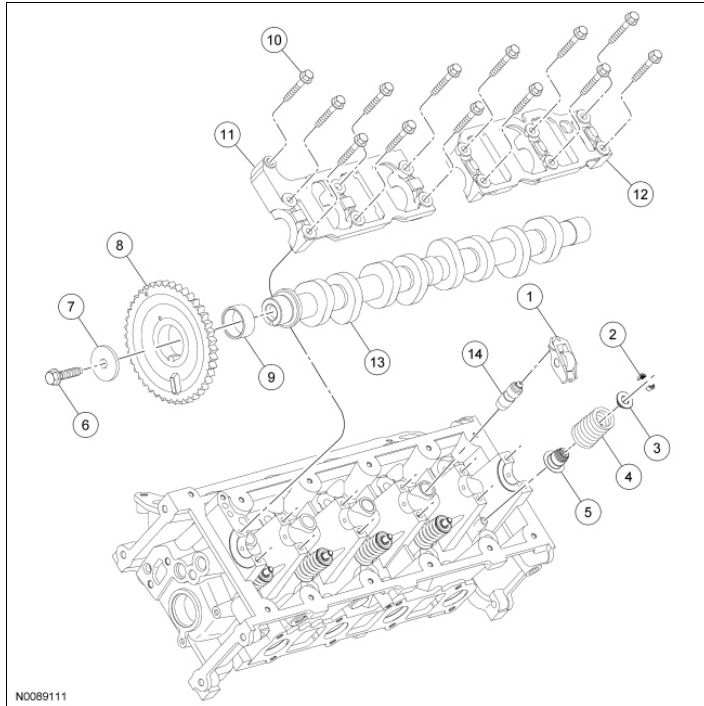
33. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system.**  
**For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Valve Train Components - Exploded View****NOTE:** LH shown, RH similar.



Item	Part Number	Description
1	6529	Camshaft roller follower (8 required)
2	6518	Valve spring retainer key (16 required)
3	6514	Valve spring retainer (8 required)
4	6513	Valve spring (8 required)
5	6A517	Valve stem seal (8 required)
6	N811085	Camshaft sprocket bolt
7	N806164	Camshaft sprocket bolt washer
8	6256	Camshaft sprocket
9	6265	Camshaft gear spacer
10	N807352	Camshaft bearing cap assembly bolt (13 required)
11	6B280	Camshaft bearing cap
12	6B280	Camshaft bearing cap
13	6A274	Camshaft
14	6C501	Hydraulic lash adjuster (8 required)

1. For additional information, refer to the procedures in this section.



## Valve Springs

### Special Tool(s)

 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-581 (T97T-6565-A)

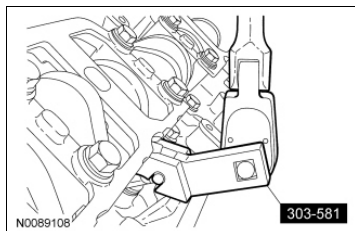
### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Remove the camshaft roller followers. For additional information, refer to [Camshaft Roller Follower](#) in this section.
3. Position the piston at the top of the stroke.
4. Remove the spark plugs. For additional information, refer to [Section 303-07](#) .
5. Install compressed air in the cylinder to hold both valves in position.
6. **NOTICE:** If air pressure has forced the piston to the bottom of the cylinder, any loss of air pressure will allow the valve to fall into the cylinder. If air pressure must be removed, support the valve prior to removal or engine damage may occur.

Using the Valve Spring Compressor, compress the valve springs.

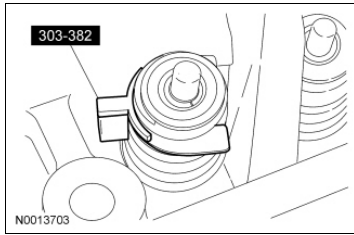


7. Remove the valve spring retainer keys, the valve spring retainer and the valve spring.

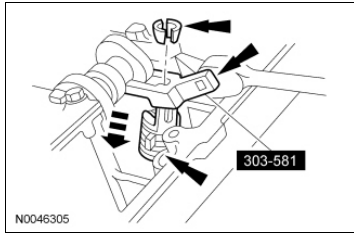
### Installation

1. Position the valve spring and the valve spring retainer.

2. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



3. Using the Valve Spring Compressor, compress the valve spring. Install the valve spring retainer keys.



4. Remove the Valve Spring Compressor and Valve Spring Compressor Spacer.
5. Install the camshaft roller followers. For additional information, refer to Camshaft Roller Follower in this section.
6. Install the spark plugs. For additional information, refer to Section 303-07 .
7. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

## Valve Seals

### Special Tool(s)

 ST1330-A	Compressor, Valve Spring 303-581 (T97T-6565-A)
 ST1332-A	Installer, Valve Stem Oil Seal 303-383 (T91P-6571-A)

### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

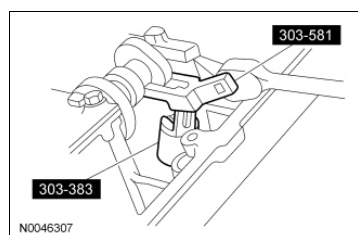
2. Remove the valve springs. For additional information, refer to [Valve Springs](#) in this section.
3. Remove the valve stem seals.

### Installation

1. **NOTE:** The valve stem seal must be bottomed on the valve seat.

**NOTE:** Make sure that the garter spring is present in the valve stem seal.

Use the Valve Spring Compressor and Valve Stem Oil Seal Installer to install the valve stem seals.



2. Install the valve springs. For additional information, refer to [Valve Springs](#) in this section.
3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



## Hydraulic Lash Adjuster

### Removal and Installation

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Remove the camshaft roller followers. For additional information, refer to Camshaft Roller Follower in this section.



3. Remove the hydraulic lash adjusters.

4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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**Camshaft Roller Follower****Special Tool(s)**

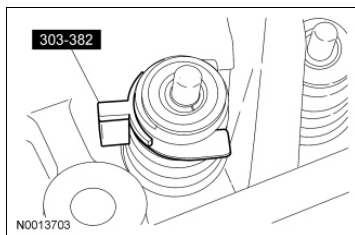
 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-581 (T97T-6565-A)

**Removal**

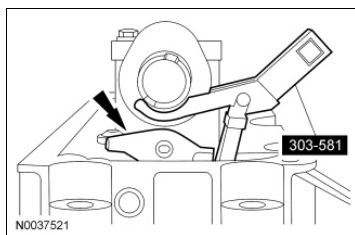
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Remove the valve covers. For additional information, refer to Valve Cover - RH or Valve Cover - LH in this section.
3. Position the piston of the cylinder being repaired at the bottom of the stroke.
4. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



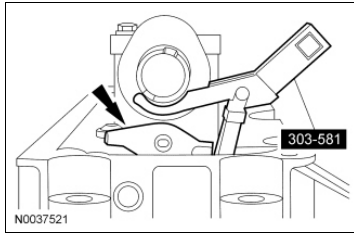
5. Using the Valve Spring Compressor, compress the valve springs and remove the camshaft roller followers.

**Installation**

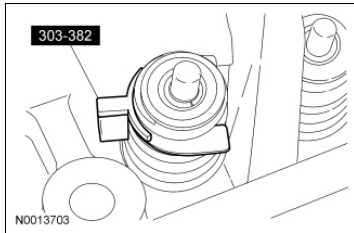
1. Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller



followers.



2. Remove the Valve Spring Compressor from between the valve spring.



3. Install the valve covers. For additional information, refer to Valve Cover - RH or Valve Cover - LH in this section.
4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

**Camshaft****Material**

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

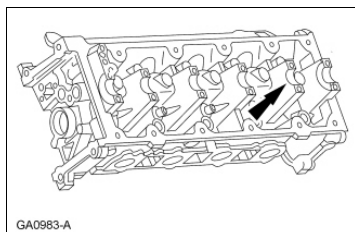
2. **NOTICE:** At no time, when the timing chains are removed and the cylinder heads are installed, may the crankshaft or camshaft be rotated. Severe piston and valve damage will occur.

Remove the camshaft roller followers. For additional information, refer to Camshaft Roller Follower in this section.

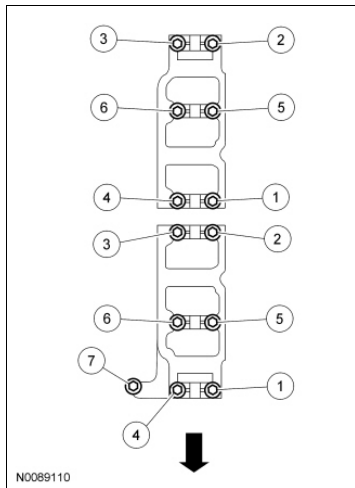
3. Remove the timing chain. For additional information, refer to Timing Drive Components in this section.
4. Remove the bolt and the camshaft sprocket and spacer.
5. Remove the 13 camshaft bearing cap bolts.
6. Remove the camshaft bearing cap.
7. Remove the camshaft from the cylinder head.

**Installation**

1. Lubricate the camshaft journals with clean engine oil.



2. Install the camshaft onto the cylinder head.
3. Lubricate the camshaft bearing cap with clean engine oil.
4. Install the camshaft bearing caps and loosely install the bolts.
5. Tighten the bolts in the sequence shown.
  - Tighten to 10 Nm (89 lb-in).

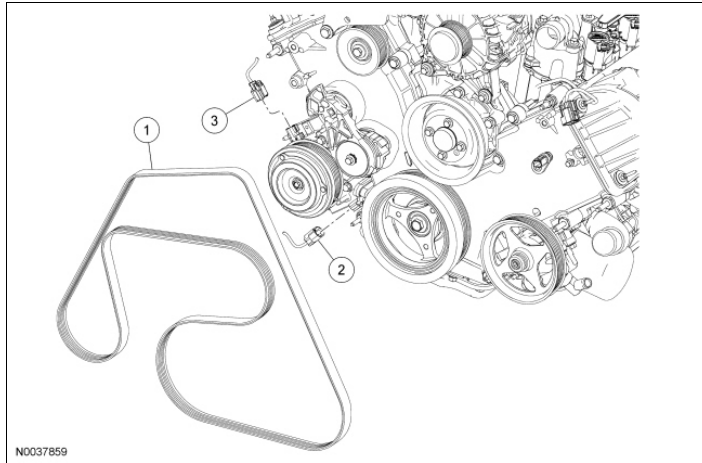


6. Install the camshaft sprocket and bolt. Tighten the bolt in 2 stages.
  - Stage 1: Tighten to 40 Nm (30 lb-ft).
  - Stage 2: Tighten an additional 90 degrees (one-fourth turn).
7. Install the timing chains. For additional information, refer to [Timing Drive Components](#) in this section.
8. Install the roller followers. For additional information, refer to [Camshaft Roller Follower](#) in this section.
9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

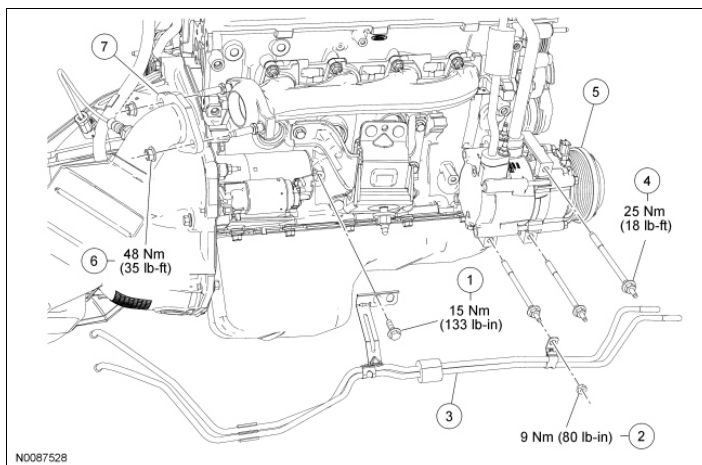
If equipped with a fire suppression system, repower the system.

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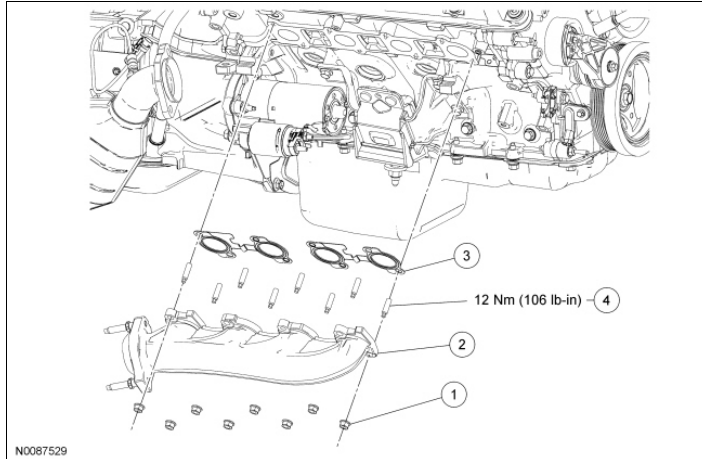
**Exhaust Manifold - RH****Exhaust Manifold - RH (View 1 of 3)**

Item	Part Number	Description
1	8620	Accessory drive belt
2	14A464	Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
3	14A464	A/C compressor electrical connector (part of 12B637)

**Exhaust Manifold - RH (View 2 of 3)**

Item	Part Number	Description
1	N807218	Transmission cooler tube bracket bolt
2	W705443	Transmission cooler tube bracket nut
3	7H420	Transmission cooler tube assembly
4	W707821	A/C compressor stud bolt (3 required)
5	19D629	A/C compressor

6	N811485	Catalytic converter-to-exhaust manifold nut (2 required)
7	5F250	Catalytic converter flange

**Exhaust Manifold - RH (View 3 of 3)**

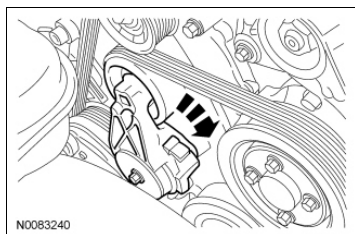
Item	Part Number	Description
1	W701706	Exhaust manifold nut (8 required)
2	9430	Exhaust manifold
3	9Y431	Exhaust manifold gasket (2 required)
4	W707747	Exhaust manifold stud (8 required)

**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
3. Rotate the drive belt tensioner clockwise and remove the drive belt.

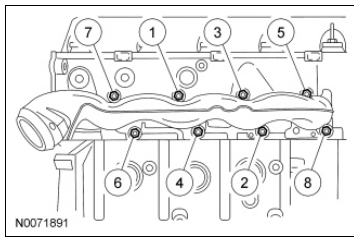


4. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
5. Disconnect the A/C compressor electrical connector.
6. Remove the bolt from the transmission cooler tube bracket.

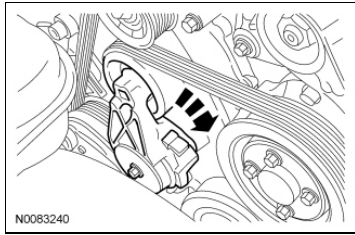
7. Remove the nut and position aside the transmission cooler tube assembly.
8. Remove the 3 bolts and position aside the A/C compressor.
9. Remove the catalytic converter-to-exhaust manifold nuts and position aside the catalytic converter flange.
  - Discard the nuts.
10. Remove the 8 nuts, the exhaust manifold and the gasket.
  - Discard the nuts and gasket.
11. Remove and discard the 8 exhaust manifold studs.
12. Clean and inspect the exhaust manifold for flatness. For additional information, refer to Section 303-00.

### Installation

1. Install the 8 new exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
2. Install a new exhaust manifold gasket, the exhaust manifold and 8 new nuts.
  - Tighten in sequence shown to 20 Nm (177 lb-in).



3. Position the catalytic converter flange and install the new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 48 Nm (35 lb-ft).
4. Position the A/C compressor and install the 3 bolts.
  - Tighten to 25 Nm (18 lb-ft).
5. Position the transmission cooler tube assembly and install the nut.
  - To install, tighten to 9 Nm (80 lb-in).
6. Install the transmission cooler tube bracket bolt.
  - To install, tighten to 15 Nm (133 lb-in).
7. Connect the A/C compressor electrical connector.
8. Connect the CKP sensor electrical connector.
9. Rotate the drive belt tensioner clockwise and install the drive belt.

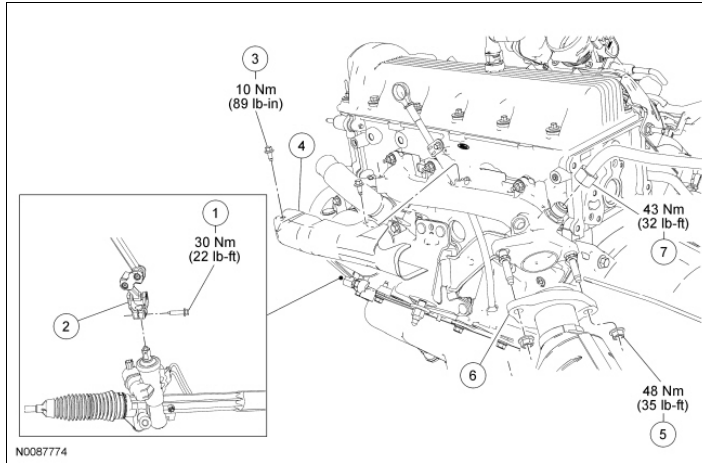


10. Connect the battery ground cable. For additional information, refer to Section 414-01 .
11. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

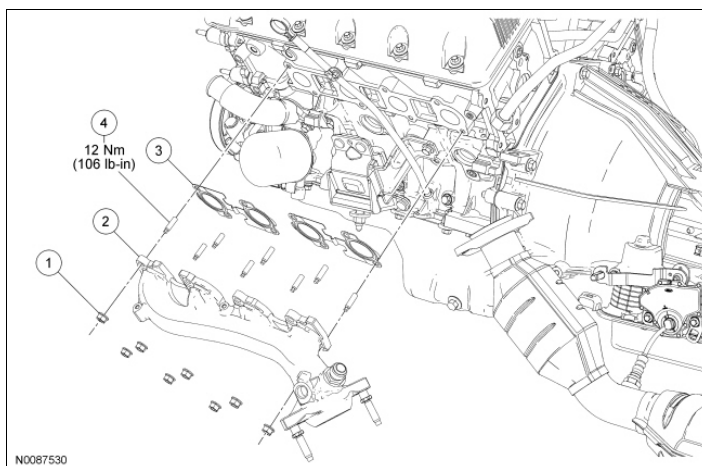
If equipped with a fire suppression system, repower the system.

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**Exhaust Manifold - LH****Exhaust Manifold - LH (View 1 of 2)**

Item	Part Number	Description
1	W710821	Intermediate steering shaft pinch bolt
2	3C662	Intermediate steering shaft
3	W707130	Exhaust manifold heat shield bolt (2 required)
4	9Y427	Exhaust manifold heat shield
5	N811485	Catalytic converter-to-exhaust manifold nut (2 required)
6	5F250	Catalytic converter flange
7	9D477	EGR system module tube

**Exhaust Manifold - LH (View 2 of 2)**

Item	Part Number	Description
1	W701706	Exhaust manifold nut (8 required)
2	9431	Exhaust manifold

3	9Y431	Exhaust manifold gasket (2 required)
4	W707747	Exhaust manifold stud (8 required)

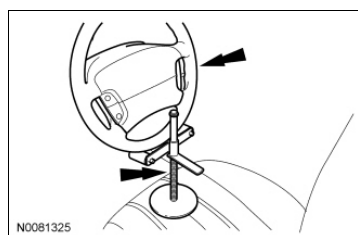
**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. **NOTE:** Use a steering wheel holding device (such as Hunter® 28-75-1 or equivalent).

Using a suitable holding device, hold the steering wheel in the straight-ahead position.



3. **NOTICE:** Do not allow the intermediate shaft to rotate while it is disconnected from the steering gear or damage to the clockspring may result. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to [Section 501-20B](#) .

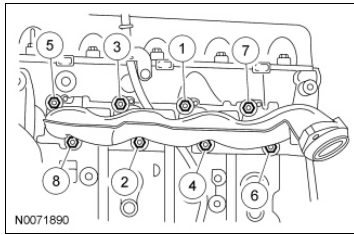
Remove the intermediated shaft pinch bolt and detach the intermediate shaft from the steering gear and position aside.

4. Remove the 2 exhaust manifold heat shield bolts and the shield.
5. Remove the 2 catalytic converter-to-exhaust manifold nuts and position aside the catalytic converter flange.
  - Discard the nuts.
6. Disconnect the EGR system module tube from the exhaust manifold.
7. Remove the LH Heated Oxygen Sensor (HO2S). For additional information, refer to [Section 303-14](#) .
8. Remove the 8 nuts, the exhaust manifold and the gasket.
  - Discard the nuts and gasket.
9. Remove and discard the 8 exhaust manifold studs.
10. Clean and inspect the exhaust manifold for flatness. For additional information, refer to [Section 303-00](#) .

**Installation**

1. Install the 8 new exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).

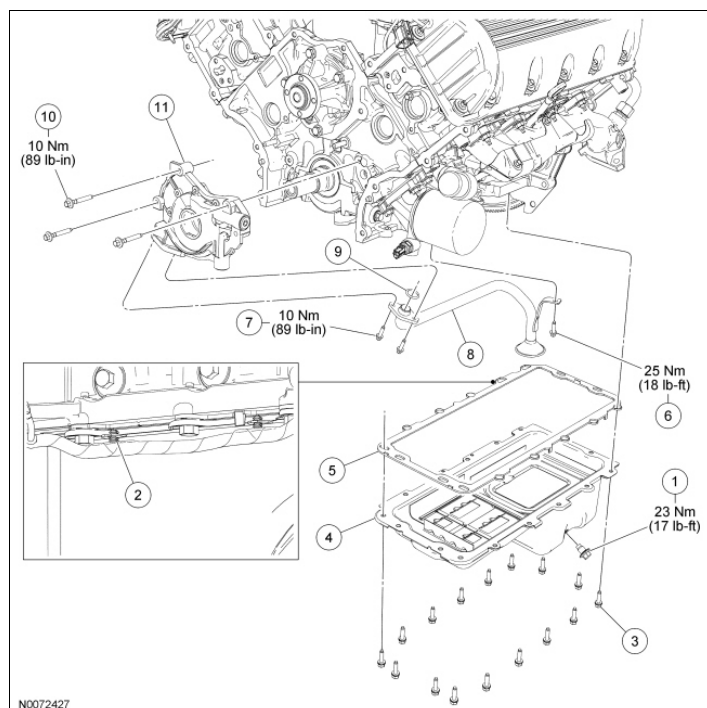
2. Install a new exhaust manifold gasket, the exhaust manifold and 8 new nuts.
  - Tighten in sequence shown to 20 Nm (177 lb-in).



3. Install the LH HO2S . For additional information, refer to [Section 303-14](#) .
4. Connect the EGR system module tube to the exhaust manifold.
  - Tighten to 43 Nm (32 lb-ft).
5. Position the catalytic converter flange and install the new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 48 Nm (35 lb-ft).
6. Install the exhaust manifold heat shield and the 2 bolts.
  - Tighten to 10 Nm (89 lb-in).
7. Position the intermediate shaft on the steering gear and install the pinch bolt.
  - Tighten to 30 Nm (22 lb-ft).
8. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

**Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube**

Item	Part Number	Description
1	6730	Oil pan drain plug
2	-	Pin-type wire harness retainer (part of 12B637) (2 required)
3	W701605	Oil pan bolt (16 required)
4	6675	Oil pan
5	6710	Oil pan gasket
6	N605904	Oil pump screen and pickup tube-to-spacer bolt
7	N806155	Oil pump screen and pickup tube-to-oil pump bolt (2 required)
8	6622	Oil pump screen and pickup tube
9	6625	Oil pump screen and tube O-ring seal
10	N806183	Oil pump bolt (3 required)
11	6621	Oil pump

1. For additional information, refer to the procedures in this section.



**Oil Pan**

## Material

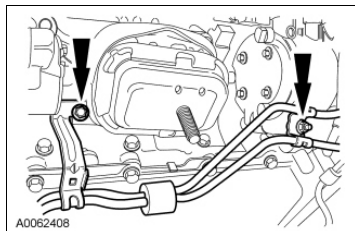
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-

**Removal**

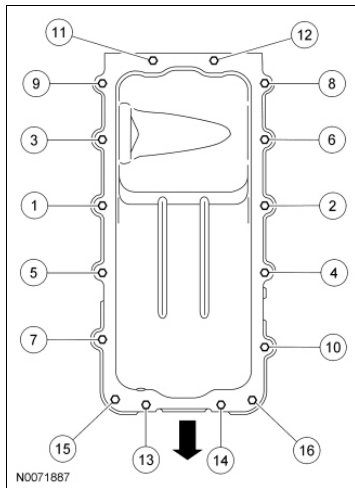
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Remove the front crossmember. For additional information, refer to [Section 502-02](#) .
3. Remove the bolt and the nut. Position the transmission cooler tubes aside.



4. Drain the engine oil.
  - Install the drain plug when finished.
  - Tighten to 23 Nm (17 lb-ft).
5. Detach the 2 pin-type wire harness retainers.
6. Remove the oil pan bolts in the sequence shown.



7. Remove the oil pan and the gasket.

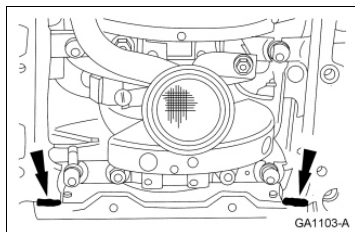
### Installation

1. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the gasket mating surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean and inspect the mating surfaces.

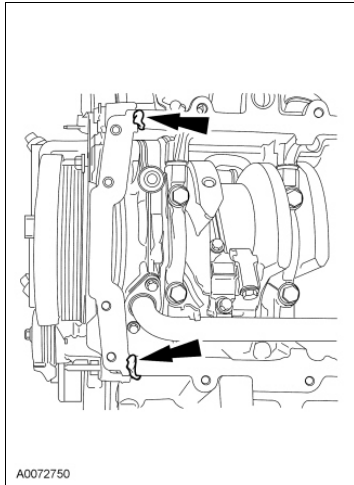
2. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply silicone gasket and sealant at the rear seal retainer-to-cylinder block sealing surface.

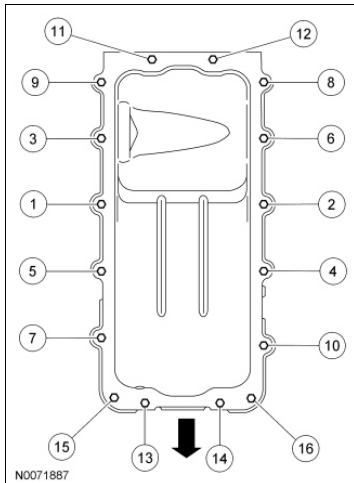


3. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

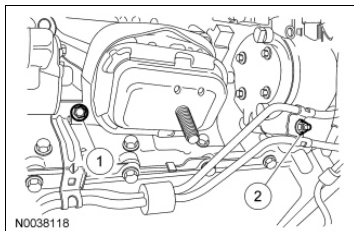
Apply silicone gasket and sealant at the engine front cover-to-cylinder block mating surface.



4. Position the oil pan gasket and the oil pan.
5. Tighten the bolts in 2 stages, in the sequence shown.
  - Stage 1: Tighten to 20 Nm (177 lb-in).
  - Stage 2: Rotate an additional 60 degrees.




6. Attach the 2 pin-type wire harness retainers.
7. Position the transmission cooler tubes and install the bolt and the nut.
  1. Tighten the bolt to 15 Nm (133 lb-in).
  2. Tighten the nut to 9 Nm (80 lb-in).



8. Install the front crossmember. For additional information, refer to [Section 502-02](#).
9. Fill the engine with clean engine oil.
10. Start the engine and check for leaks.



11.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

## Oil Pump

### Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A** .

2. Remove the oil pan. For additional information, refer to **Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube** and **Oil Pan** in this section.
3. Remove the timing drive components. For additional information, refer to **Timing Drive Components** in this section.
4. Remove the 3 bolts, the oil pump screen and pickup tube.
  - Discard the O-ring seal.
5. Remove the 3 bolts and the oil pump.

### Installation

1. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging. Inspect the mating surfaces.

2. Position the oil pump and install the 3 bolts.
  - Tighten to 10 Nm (89 lb-in).
3. **NOTICE:** Make sure the O-ring seal is in place and not damaged. A missing or damaged O-ring seal can cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil prior to installation.

Position the oil pump screen and pickup tube and install the bolts.

- Tighten the oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
  - Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).
4. Install the timing drive components. For additional information, refer to Timing Drive Components in this section.
  5. Install the oil pan. For additional information, refer to Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube and Oil Pan in this section.
  6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

**Oil Pump Screen and Pickup Tube**

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Remove the oil pan. For additional information, refer to Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube and Oil Pan in this section.
3. Remove the 3 bolts, the oil pump screen and pickup tube.
  - Discard the O-ring seal.

**Installation**

1. **NOTICE:** Make sure the O-ring seal is in place and not damaged. A missing or damaged O-ring seal can cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil prior to installation.

Position the oil pump screen and pickup tube and install the bolts.

- Tighten the oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
  - Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).
2. Install the oil pan. For additional information, refer to Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube and Oil Pan in this section.
  3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

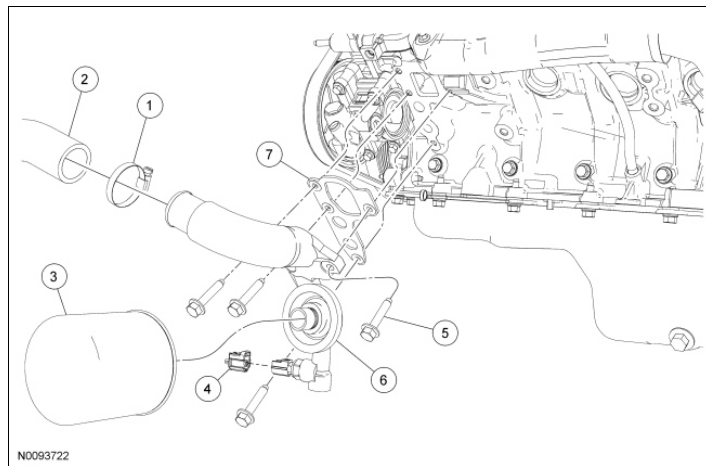
If equipped with a fire suppression system, repower the system.



**Oil Filter Adapter**

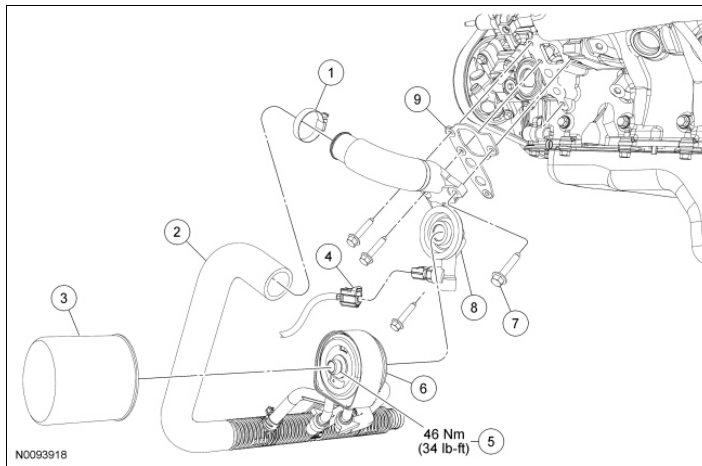
## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Oil Filter Adapter Without Oil Cooler**

Item	Part Number	Description
1	W525939	Lower radiator hose clamp
2	8B273	Lower radiator hose
3	6714	Oil filter
4	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12B637)
5	W705128	Oil filter adapter bolt (4 required)
6	6881	Oil filter adapter
7	6A636	Oil filter adapter gasket

**Oil Filter Adapter With Oil Cooler**



Item	Part Number	Description
1	W525939	Lower radiator hose clamp
2	8B273	Lower radiator hose
3	6714	Oil filter
4	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12B637)
5	6890	Oil cooler mounting bolt
6	6A642	Oil cooler
7	W705128	Oil filter adapter bolt (4 required)
8	6881	Oil filter adapter
9	6A636	Oil filter adapter gasket

### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Drain the cooling system. For additional information, refer to [Section 303-03](#) .
3. Disconnect the lower radiator hose from the oil filter adapter.
4. Remove and discard the oil filter.
5. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
6. If equipped, remove the oil cooler mounting bolt and position the oil cooler aside.
7. Remove the 4 bolts and the oil filter adapter and gasket.
  - Discard the oil filter adapter gasket.

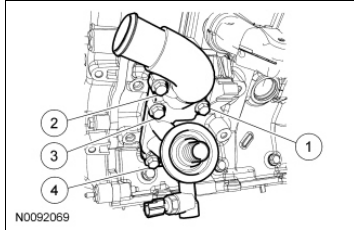
### Installation

1. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surface. These tools cause scratches and gouges that make leak paths.

**Use a plastic scraping tool to remove all traces of the gasket material.**

Clean the sealing surfaces.

2. Install a new gasket and the oil filter adapter and tighten the 4 bolts in the sequence shown.
  - Tighten to 25 Nm (18 lb-ft).



3. **NOTE:** Lubricate the oil cooler-to-oil filter adapter seal with clean engine oil.

If equipped, position the oil cooler and install the oil cooler mounting bolt.

- Tighten to 46 Nm (34 lb-ft).

4. Connect the EOP switch electrical connector.

5. **NOTE:** Lubricate the oil filter seal with clean engine oil.

Install the oil filter.

6. Connect the lower radiator hose to the oil filter adapter.

7. Fill and bleed the cooling system. For additional information, refer to Section 303-03 .

8. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

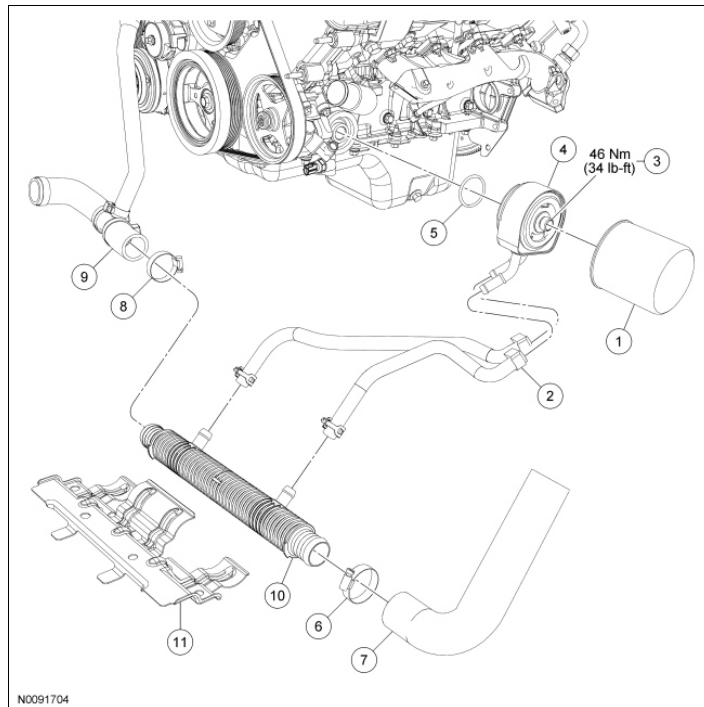




**Oil Cooler**

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A



Item	Part Number	Description
1	6714	Oil filter
2	8B273	Oil cooler coolant hose (2 required)
3	6890	Oil cooler mounting bolt
4	6A642	Oil cooler
5	-	Oil cooler-to-oil filter adapter O-ring seal
6	15161	Coolant hose clamp
7	8286	Coolant hose
8	15161	Coolant hose clamp
9	8286	Coolant hose
10	-	Coolant tube
11	-	Cooler tube mounting bracket

**Removal and Installation**

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Drain the cooling system. For additional information, refer to Section 303-03 .
3. Remove and discard the oil filter.
  - To install, lubricate the new oil filter O-ring seal with clean engine oil.

4. **NOTICE: For correct installation, the white lines on the coolant hoses must be aligned with the black dots on the oil cooler tubes. If the black dots are not visible, mark the oil cooler tube with a permanent marker before disconnecting the hoses. Failure to follow this instruction may result in damage to the coolant hoses.**

Disconnect the 2 coolant hoses from the oil cooler.

- To install, align the white lines on the coolant hoses with the black dots on the cooler tubes.

5. **NOTICE: If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Severe damage to the engine may occur. To diagnose mechanical concerns, refer to Section 303-00 . Failure to follow this instruction may result in additional engine damage.**

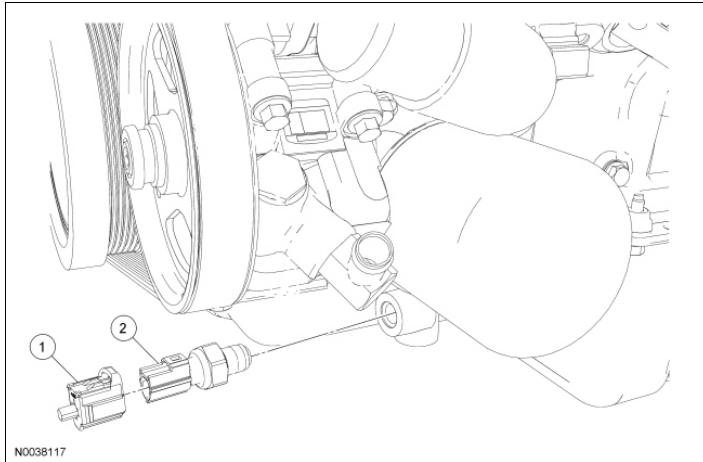
Remove the oil cooler mounting bolt and the oil cooler and inspect.

- To install, lubricate the oil cooler-to-oil filter adapter O-ring seal with clean engine oil.
- To install, tighten to 46 Nm (34 lb-ft).

6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.



**Engine Oil Pressure (EOP) Switch**

Item	Part Number	Description
1	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12B637)
2	9278	EOP switch

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the Engine Oil Pressure (EOP) switch electrical connector and remove the EOP switch.
  - To install, tighten to 14 Nm (124 lb-in), then tighten an additional 180 degrees.
3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

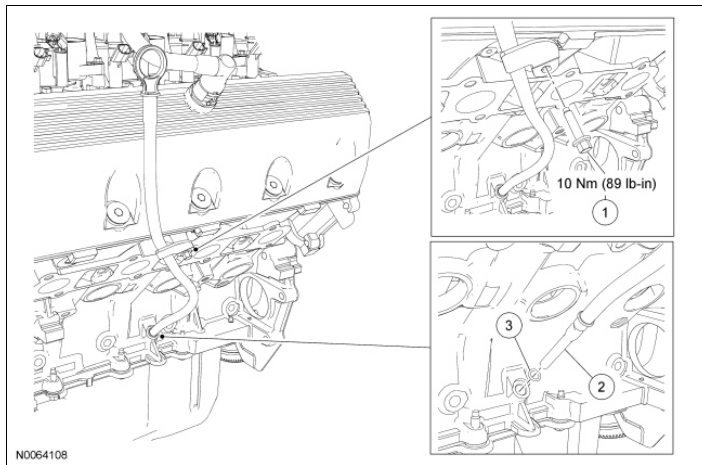
To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.



**Oil Level Indicator and Tube**

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A



Item	Part Number	Description
1	N806155	Oil level indicator tube bolt
2	6754	Oil level indicator tube
3	-	Oil level indicator tube O-ring seal

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .


2. Remove the LH exhaust manifold. For additional information, refer to [Exhaust Manifold - LH](#) in this section.
3. Remove the oil level indicator.
4. Remove the bolt and the oil level indicator tube.
  - To install, tighten to 10 Nm (89 lb-in).

5. **NOTICE:** Failure to lubricate the O-ring seal and the oil level indicator tube-to-engine block

mating surface with clean engine oil may result in engine oil leaks.

**NOTICE:** Make sure the O-ring seal remains in position and does not roll up the indicator tube during installation or engine oil leaks may occur.

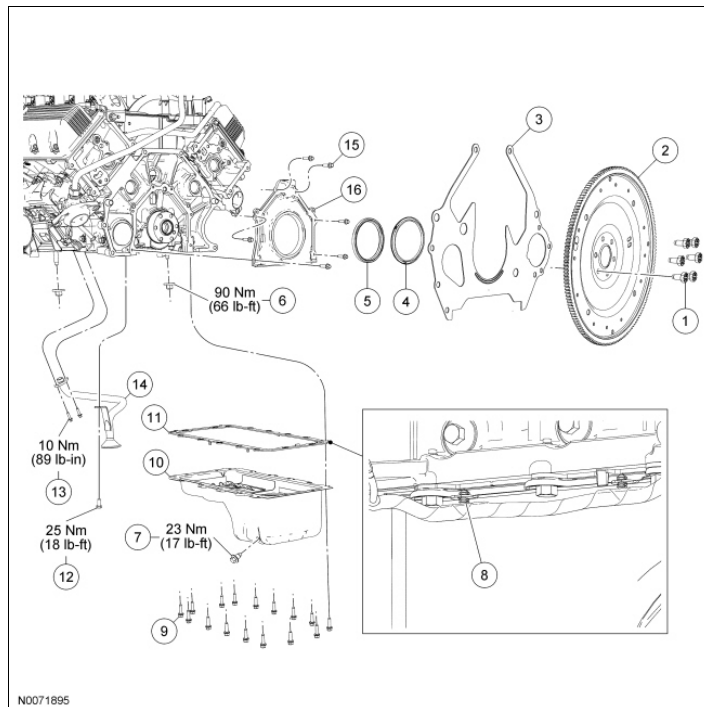
Remove the O-ring seal and discard.

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Lubricate the new O-ring seal and engine mating surface with clean engine oil.
-



**Lower End Components - Exploded View, Flexplate and Crankshaft Rear Seal with Retainer Plate**

Item	Part Number	Description
1	N806168	Flexplate bolt (6 required)
2	6375	Flexplate
3	6A373	Engine-to-transmission spacer plate
4	6310	Crankshaft oil slinger
5	6701	Crankshaft rear seal
6	W707492	Engine mount nut (2 required)
7	6730	Oil pan drain plug
8	-	Wire harness pin-type retainer (2 required)
9	W701605	Oil pan bolt (16 required)
10	6675	Oil pan
11	6710	Oil pan gasket
12	N605904	Oil pump screen and pickup tube bolt
13	N806155	Oil pump screen and pickup tube bolt (2 required)
14	6622	Oil pump screen and pickup tube
15	N806155	Crankshaft rear seal retainer plate bolt (6 required)
16	6K318	Crankshaft rear seal retainer plate

1. For additional information, refer to the procedures in this section.



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## Flexplate

### Removal

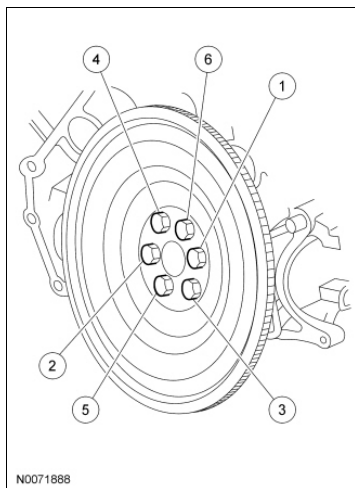
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Remove the transmission. For additional information, refer to Section 307-01 .
3. Remove the 6 bolts and the flexplate.

### Installation

1. Position the flexplate and loosely install the 6 bolts. Tighten the bolts in the sequence shown to 80 Nm (59 lb-ft).



2. Install the transmission. For additional information, refer to Section 307-01 .
3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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**Crankshaft Rear Seal**

## Special Tool(s)

 ST1479-A	Installer, Crankshaft Rear Oil Seal 303-516 (T95P-6701-BH)
 ST1480-A	Installer, Crankshaft Rear Oil Seal 303-518 (T95P-6701-DH)
 ST1482-A	Installer, Crankshaft Rear Oil Slinger 303-517 (T95P-6701-CH)
 ST1382-A	Remover, Crankshaft Rear Oil Seal 303-519 (T95P-6701-EH)
 ST1481-A	Remover, Crankshaft Rear Oil Slinger 303-514 (T95P-6701-AH)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

## Material

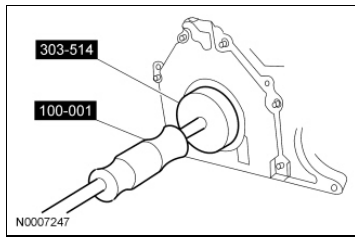
Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Removal**

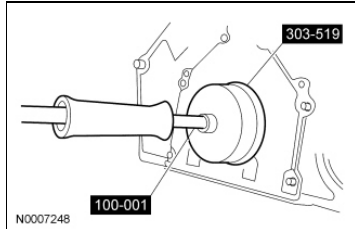
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A**.

2. Remove the flexplate. For additional information, refer to **Flexplate** in this section.
3. Using the Crankshaft Rear Oil Slinger Remover and Slide Hammer, remove the crankshaft oil slinger.



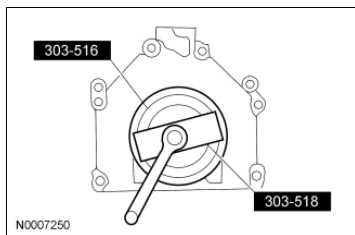
4. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove the crankshaft rear seal.



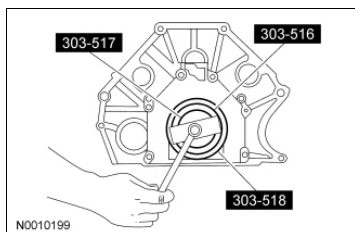
## Installation

1. **NOTE:** Lubricate the inner lip of the crankshaft rear seal with engine oil.

Using the Crankshaft Rear Oil Seal Installers, install the crankshaft rear seal.



2. Using the Crankshaft Rear Oil Slinger Installer and Crankshaft Rear Oil Seal Installers, install the crankshaft oil slinger.



3. Install the flexplate. For additional information, refer to [Flexplate](#) in this section.
4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



**Crankshaft Rear Seal with Retainer Plate**

## Special Tool(s)

 ST1479-A	Installer, Crankshaft Rear Oil Seal 303-516 (T95P-6701-BH)
 ST1480-A	Installer, Crankshaft Rear Oil Seal 303-518 (T95P-6701-DH)
 ST1482-A	Installer, Crankshaft Rear Oil Slinger 303-517 (T95P-6701-CH)
 ST1603-A	Lifting Bracket, Engine 303-D087 (D93P-6001-A1) or equivalent
 ST1604-A	Lifting Bracket, Engine 303-D088 (D93P-6001-A2) or equivalent
 ST1382-A	Remover, Crankshaft Rear Oil Seal 303-519 (T95P-6701-EH)
 ST1481-A	Remover, Crankshaft Rear Oil Slinger 303-514 (T95P-6701-AH)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST2425-A	Support Bar, Engine 303-F072

## Material

Item	Specification
Gasket Maker TA-16	WSK-M2G348-A5
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or	WSS-M2C930-A



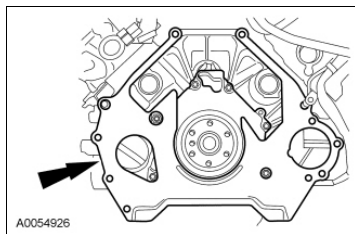
equivalent	
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-

**Removal**

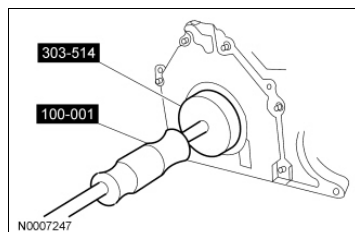
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

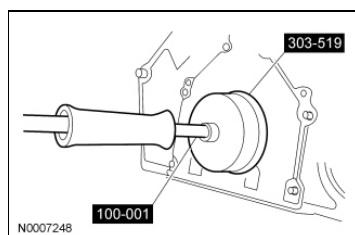
2. Remove the flexplate. For additional information, refer to [Flexplate](#) in this section.
3. Remove the engine-to-transmission spacer plate.



4. Using the Crankshaft Rear Oil Slinger Remover and Slide Hammer, remove the crankshaft oil slinger.

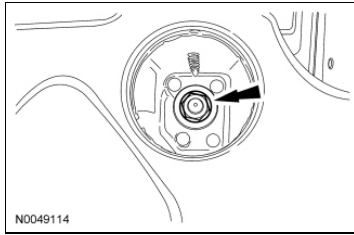


5. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove the crankshaft rear seal.

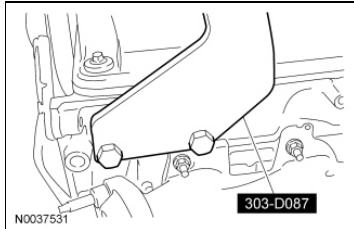


6. **NOTE:** LH shown, RH similar.

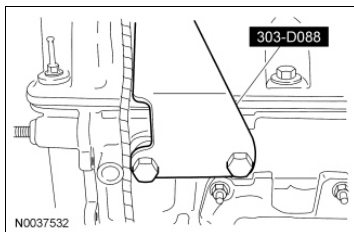
Remove the 2 engine mount nuts.



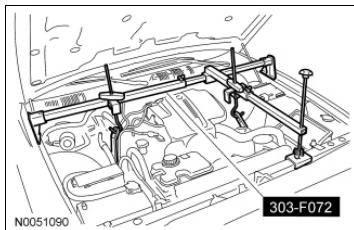
7. Install the Engine Lifting Bracket to the RH cylinder head.



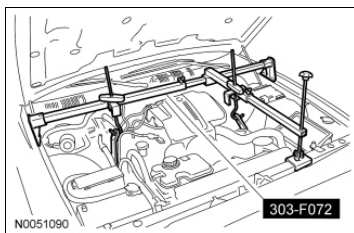
8. Install the Engine Lifting Bracket to the LH cylinder head.



9. Install the Engine Support Bar.



10. Using the Engine Support Bar, raise the engine.

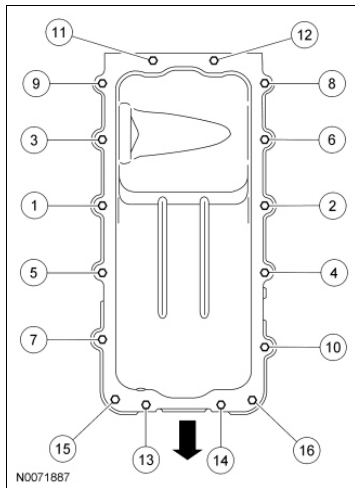


11. Drain the engine oil.

- Install the drain plug when finished.
- Tighten to 23 Nm (17 lb-ft).

12. Detach the 2 pin-type wire harness retainers.

13. Remove the oil pan bolts in the sequence shown and partially lower the oil pan.



14. Remove the 3 bolts and position the oil pump screen and pickup tube into the oil pan and remove the oil pan.
  - Discard the pickup tube O-ring seal.
  - Discard the oil pan gasket.
15. Remove the 6 bolts and the crankcase rear seal retainer plate.

### Installation

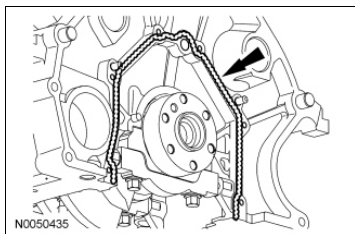
1. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

**NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

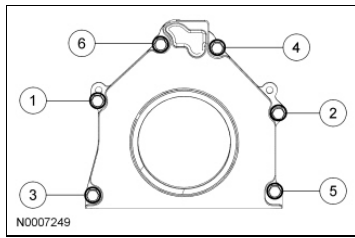
Clean and inspect the mating surface.

2. **NOTE:** The rear crankshaft seal retainer plate does not have a sealant groove. Gasket maker must be applied to the rear crankshaft seal retainer mating surface on the engine block.

Apply a bead of gasket maker to the rear crankshaft seal retainer mating surface on the engine block.

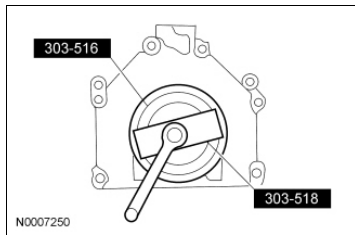


3. Install the rear oil seal retainer plate and loosely install the 6 crankcase rear seal retainer plate bolts.
4. Tighten the rear seal retainer plate bolts in the sequence shown.
  - Tighten to 10 Nm (89 lb-in).

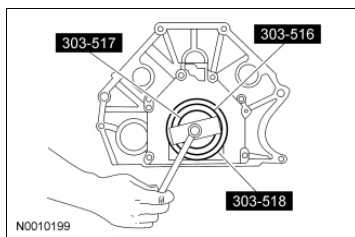


5. **NOTE:** Lubricate the inner lip of the crankshaft rear seal with engine oil.

Using the Crankshaft Rear Oil Seal Installers, install the crankshaft rear seal.



6. Using the Crankshaft Rear Oil Slinger Installer and Crankshaft Rear Oil Seal Installers, install the crankshaft oil slinger.



7. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Inspect the oil pan. Clean the mating surface for the oil pan with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

8. Position the oil pump screen and pickup tube in the oil pan and position the oil pan and new gasket into the vehicle.

9. **NOTICE:** Make sure to install a new O-ring seal. A missing or damaged O-ring seal may cause foam in the lubrication system, low oil pressure and severe engine damage.

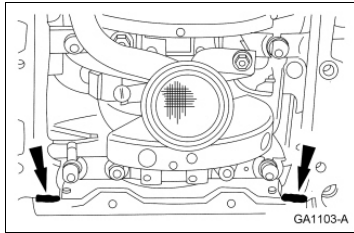
**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil prior to installation.

Position the oil pump screen and pickup tube and install the bolts.

- Tighten the oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
- Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).

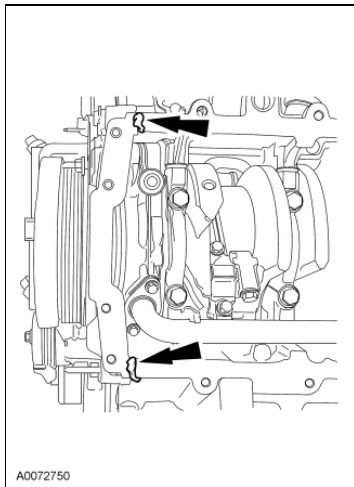
10. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply silicone gasket and sealant at the rear seal retainer-to-cylinder block sealing surface.



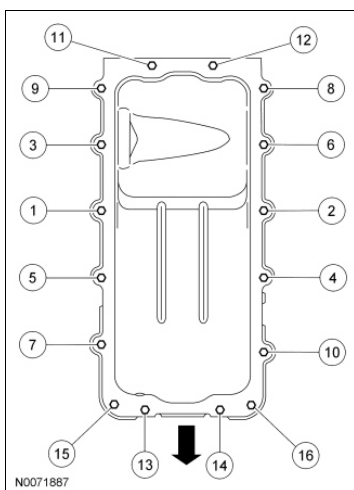
11. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply silicone gasket and sealant at the engine front cover-to-cylinder block mating surface.



12. Install the oil pan bolts, tighten in the sequence shown, in 2 stages.

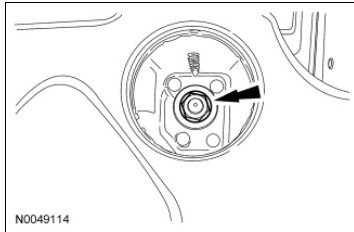
- Stage 1: Tighten to 20 Nm (177 lb-in).
- Stage 2: Rotate an additional 60 degrees.



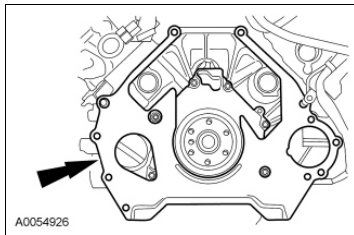
13. Attach the 2 pin-type wire harness retainers.
14. Align the engine mount studs and lower the engine.
15. **NOTE:** LH shown, RH similar.

Install the 2 engine mount nuts.

- Tighten to 90 Nm (66 lb-ft).



16. Install the engine-to-transmission spacer plate.



17. Install the flexplate. For additional information, refer to Flexplate in this section.

18. Fill the engine with clean engine oil.

19. Start the engine and check for leaks.

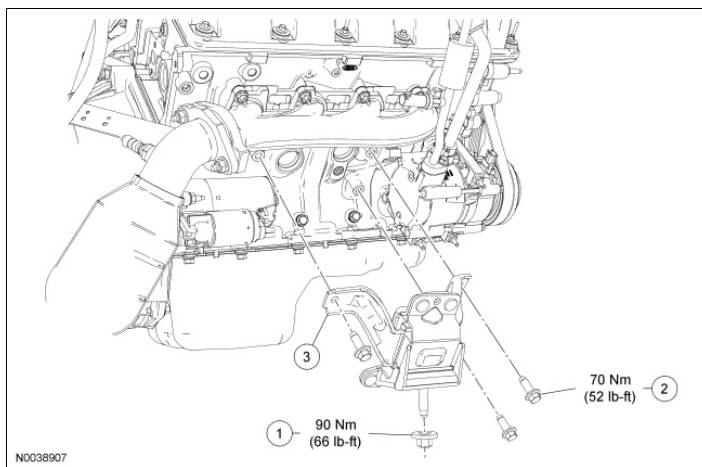
20. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

**Engine Mount - RH**

## Special Tool(s)

 ST1595-A	Lifting Bracket, Engine 303-050 (T70P-6000)
 ST2425-A	Support Bar, Engine 303-F072



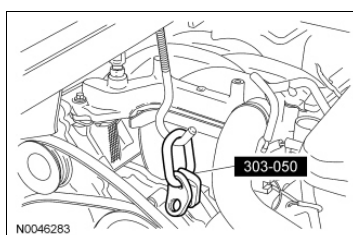
Item	Part Number	Description
1	W707492	RH engine mount nut
2	W710646	RH engine mount bolt (3 required)
3	6038	RH engine mount

**Removal and Installation**

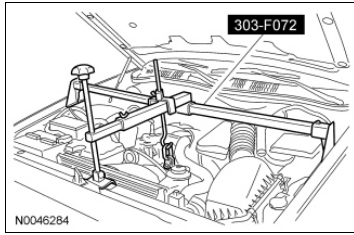
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Remove the generator. For additional information, refer to [Section 414-00](#) .
3. Install the Engine Lifting Bracket.



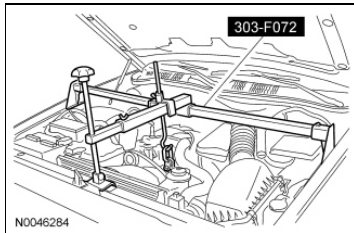
4. Install the Engine Support Bar.



5. Remove the RH and LH lower engine mount nuts.

- To install, tighten to 90 Nm (66 lb-ft).

6. Using the Engine Support Bar, raise the engine.



7. Remove the 3 RH engine mount bolts.

- To install, tighten to 70 Nm (52 lb-ft).

8. Remove the RH engine mount.

9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**


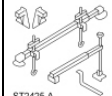
To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.





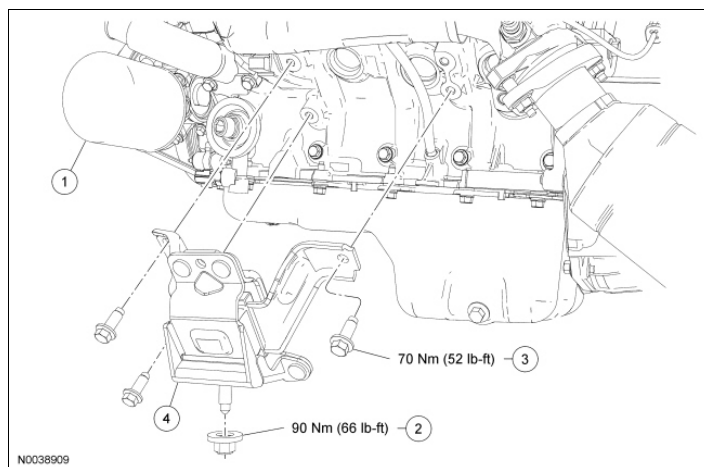
**Engine Mount - LH**

## Special Tool(s)

	Lifting Bracket, Engine 303-050 (T70P-6000)
	Support Bar, Engine 303-F072

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A



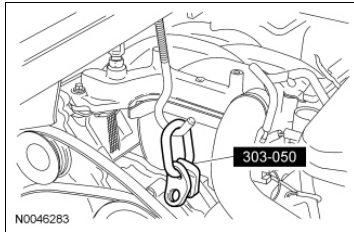
Item	Part Number	Description
1	6714	Oil filter
2	W707492	LH engine mount nut
3	W710646-S439	LH engine mount bolt (3 required)
4	6B032	LH engine mount

**Removal and Installation**

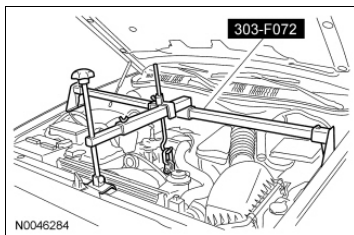
- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

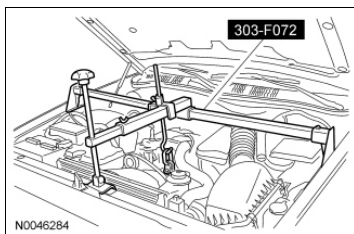
2. Remove the generator. For additional information, refer to [Section 414-00](#).
3. Install the Engine Lifting Bracket.



4. Install the Engine Support Bar.



5. Remove the oil filter and discard.
  - Lubricate the new oil filter O-ring seal with clean engine oil prior to installation.
6. Remove the LH and RH lower engine mount nuts.
  - To install, tighten to 90 Nm (66 lb-ft).
7. Using the Engine Support Bar, raise the engine.









8. Remove the 3 bolts and the LH engine mount.
  - To install, tighten to 70 Nm (52 lb-ft).
9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#). Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.



**Cylinder Head**

## Special Tool(s)

 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-567 (T97P-6565-AH)
 ST2443-A	Lifting Bracket Set, Engine 303-DS086 (D93P-6001-A) or equivalent
 ST1730-A	Remover, Crankshaft Front Oil Seal 303-107 (T74P-6700-A)
 ST1286-A	Remover, Crankshaft Vibration Damper 303-009 (T58P-6316-D)
 ST1658-A	Remover/Installer, Cylinder Head 303-572 (T97T-6000-A)

## Material

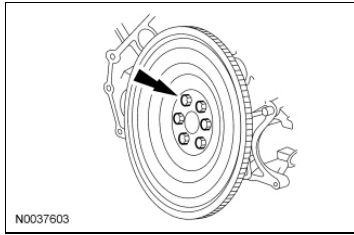
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Gasket Remover ZC-30	-

**Removal****Cylinder heads**

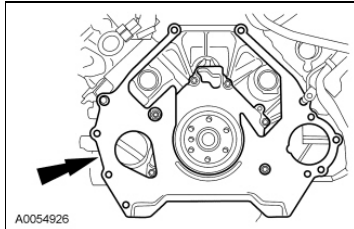
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A**.

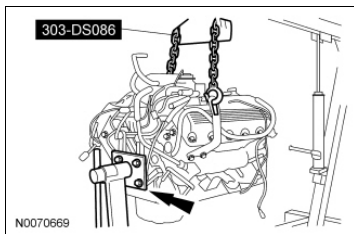
2. Remove the engine. For additional information, refer to **Engine** in the Removal portion of this section.
3. Remove the bolts and the flexplate.



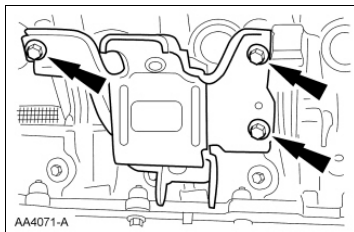
4. Remove the engine/transmission spacer plate.



5. Using the Engine Lifting Bracket Set, mount the engine on a suitable engine stand.



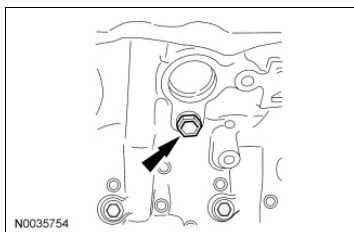
6. If equipped with cylinder block drain plugs, remove the bolts and the RH engine mount.



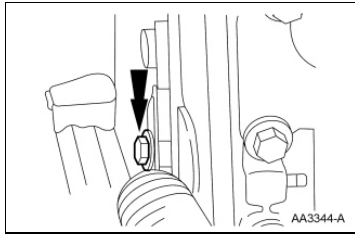
7. **NOTE:** LH shown, RH similar.

If equipped, remove the drain plugs from the engine block. Allow the coolant to completely drain.

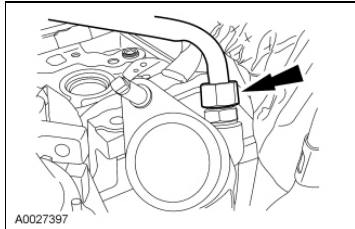
- Install the drain plugs when finished.
- To install, tighten to 20 Nm (177 lb-in).



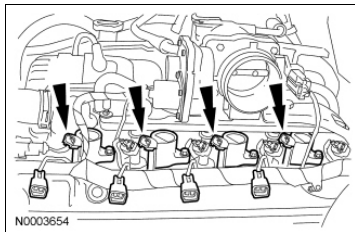
8. Remove the bolt and the battery cables from the engine.



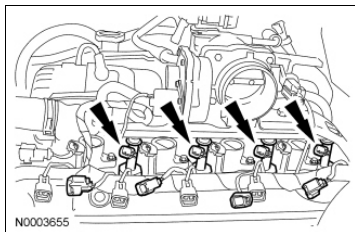
9. Disconnect the EGR tube from the exhaust manifold.



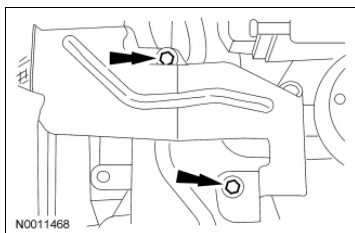
10. Disconnect the 8 ignition coil electrical connectors (4 shown).



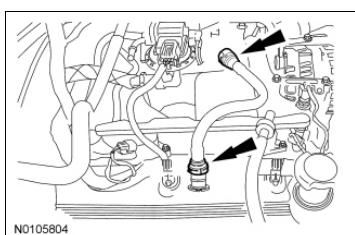
11. Disconnect the 8 fuel injector electrical connectors (4 shown).



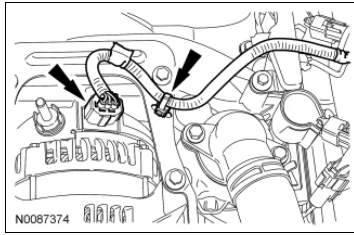
12. Remove the 2 bolts and the intake manifold shield.



13. Remove the crankcase ventilation tube.

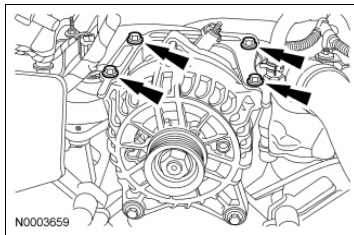


14. Disconnect the generator electrical connector and detach the wire harness retainer.

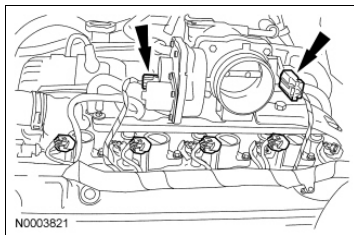


15. Remove the generator mounting bracket.

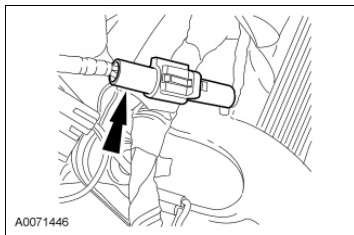
- Remove the 4 bolts.
- Remove the bracket.



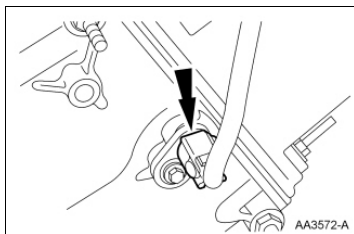
16. Disconnect the throttle control and the Throttle Position (TP) sensor electrical connectors.



17. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.

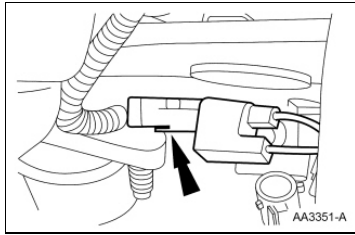


18. Disconnect the Camshaft Position (CMP) sensor electrical connector.

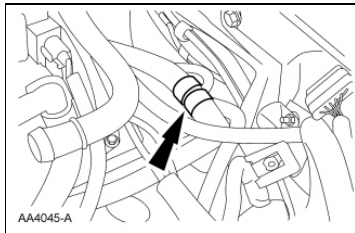


19. Disconnect the radio ignition interference capacitor and remove the engine control sensor wiring.

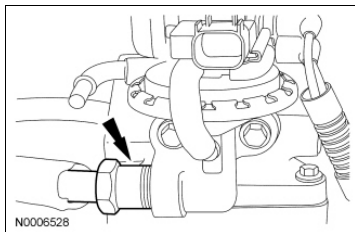




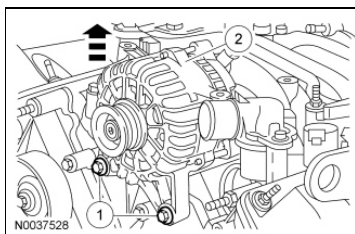
20. Disconnect the fuel charging wiring from the crash bracket and the wiring support bracket and remove the harness from the engine.



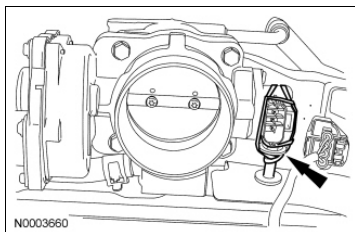
21. Disconnect the EGR tube nut from the EGR system module.



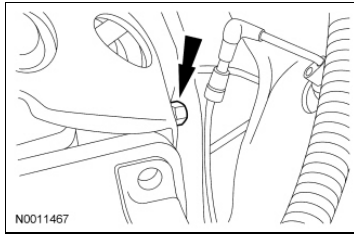
22. Remove the generator.  
1. Remove the 2 bolts.  
2. Remove the generator.



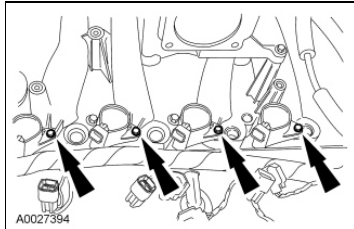
23. Remove the intake manifold crash bracket bolt and prevent the bolt from contacting the cylinder head with a rubber band or tie strap.



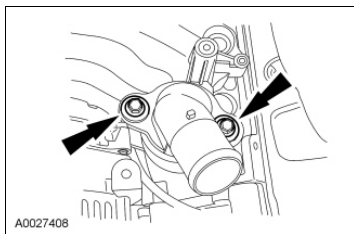
24. Remove the intake manifold crash bracket stud bolt.



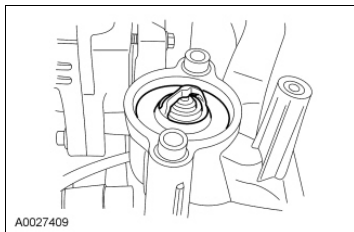
25. Remove the 8 bolts and the 8 ignition coils (4 shown).



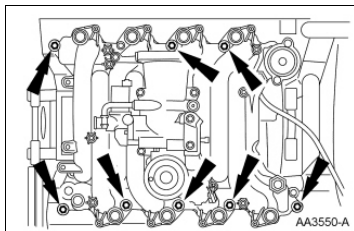
26. Remove the 2 bolts and the coolant outlet adapter.



27. Remove the thermostat.

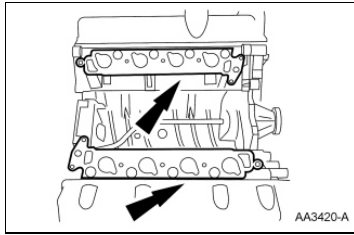


28. Remove the 8 bolts and the intake manifold.  
• Discard the intake manifold gaskets.

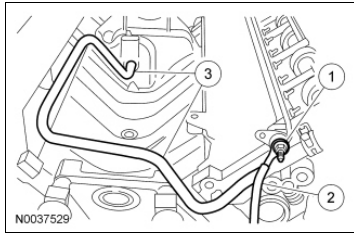


29. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

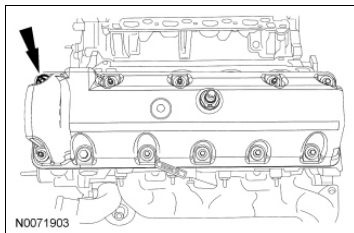
Clean the sealing surfaces.



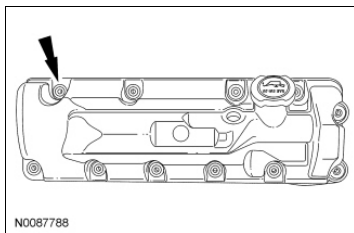
30. Remove the coolant bypass tube.
  1. Remove the retaining nut.
  2. Remove the ground strap.
  3. Remove the coolant bypass tube.



31. Loosen the studs and bolts and remove the LH valve cover.
  - Clean the mating surface and discard gasket.



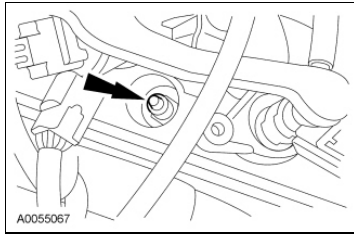
32. Loosen the studs and bolts and remove the RH valve cover.
  - Discard the gasket.



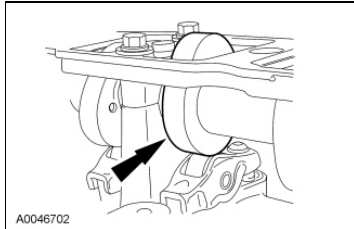
33. **NOTICE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.

**NOTE:** Use compressed air to remove any foreign material from the spark plug well before removing the spark plugs.

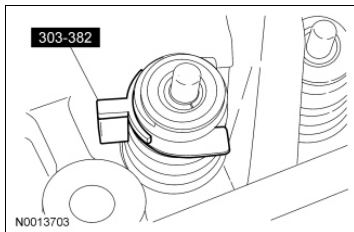
Remove the spark plugs.



34. Position the lobe of the camshaft upward.

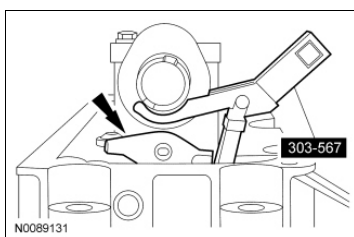


35. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



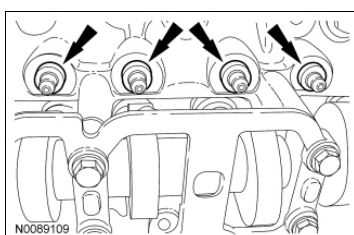
36. **NOTICE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.

Using the Valve Spring Compressor, compress the valve springs and remove the camshaft roller followers.

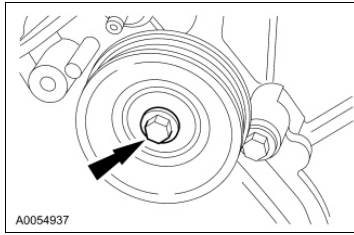


37. **NOTICE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.

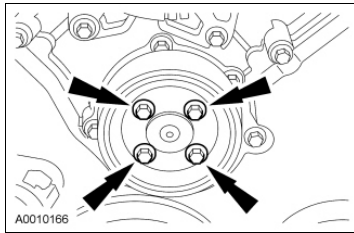
Remove the 16 hydraulic lash adjusters (4 shown).



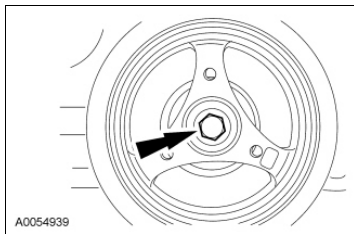
38. Remove the bolt and the belt idler pulley.



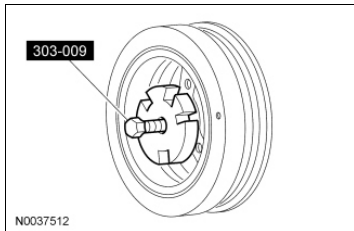
39. Remove the coolant pump pulley.



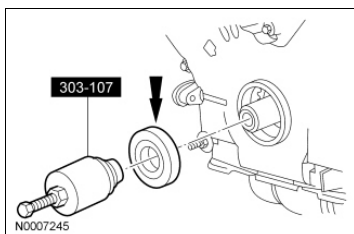
40. Remove the crankshaft pulley bolt.



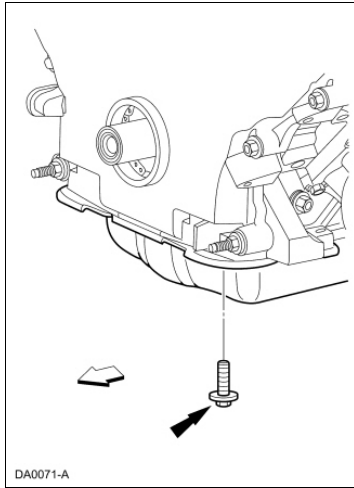
41. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley.



42. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft front oil seal.

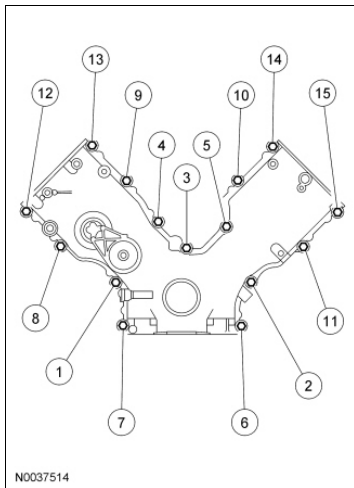


43. Remove the front 4 oil pan bolts.



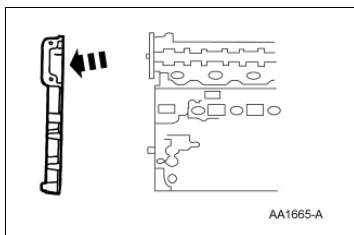
44. **NOTE:** Correct fastener location is essential for the installation. Record fastener location.

Remove the 15 fasteners in the sequence shown.

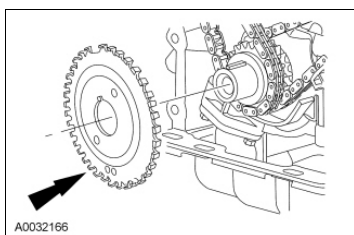


45. Remove the engine front cover from the cylinder block.

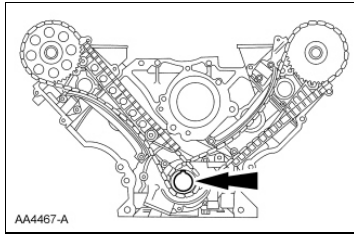
- Discard the gaskets.



46. Remove the crankshaft sensor ring.



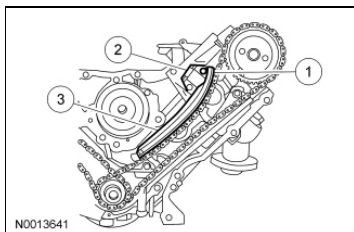
47. Position the crankshaft with the keyway at the 12 o'clock position.



48. **NOTE:** LH shown, RH similar.

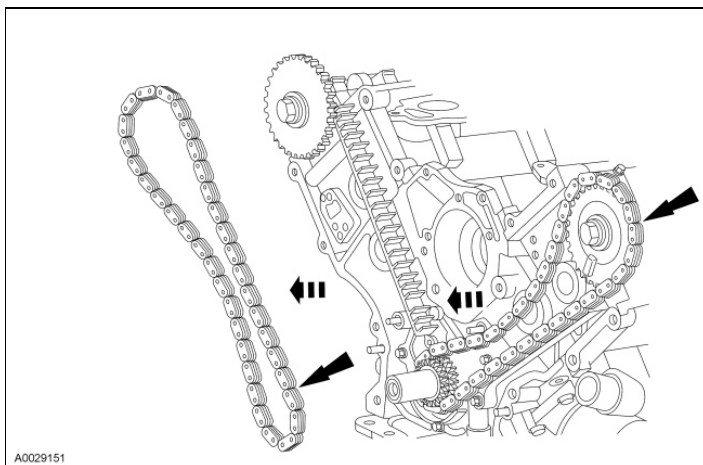
Remove the timing chain tensioning system from both timing chains.

1. Remove the bolts.
2. Remove the timing chain tensioners.
3. Remove the timing chain tensioner arms.



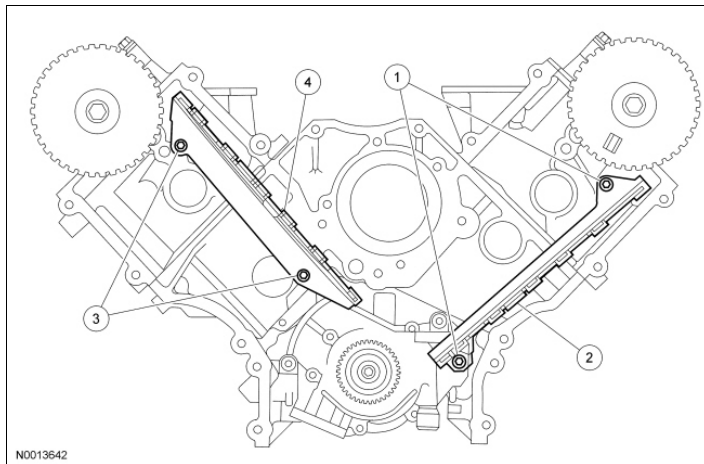
49. Remove the LH and RH timing chains and the crankshaft sprocket.

- Remove the RH timing chain from the camshaft sprocket.
- Remove the RH timing chain from the crankshaft sprocket.
- Repeat for the LH timing chain and crankshaft sprocket.



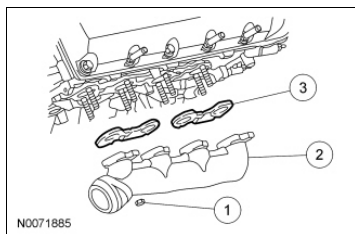
50. Remove both timing chain guides.

1. Remove the bolts.
2. Remove the LH timing chain guide.
3. Remove the bolts.
4. Remove the RH timing chain guide.



### RH cylinder head

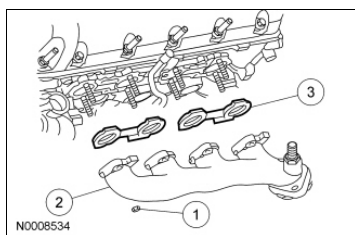
51. Remove the RH exhaust manifold.
  1. Remove the nuts and discard.
  2. Remove the RH exhaust manifold.
  3. Remove and discard the RH exhaust manifold gasket.



52. Remove and discard the 8 RH exhaust manifold studs.

### LH cylinder head

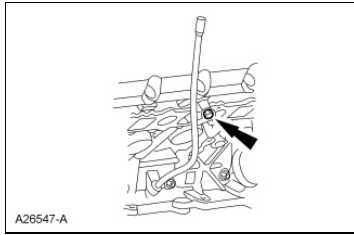
53. Remove the LH exhaust manifold.
  1. Remove the nuts and discard.
  2. Remove the LH exhaust manifold.
  3. Remove and discard the LH exhaust manifold gaskets.



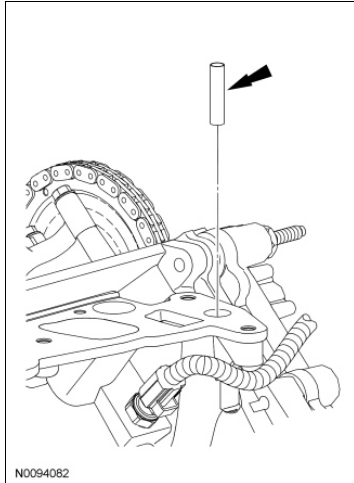
54. Remove and discard the 8 LH exhaust manifold studs.

55. Remove the bolt and the oil level indicator tube.





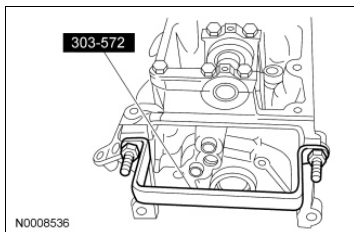
56. Remove the cylinder head insert from the LH cylinder head.



### Both cylinder heads

57. Clean and inspect the exhaust manifolds. For additional information, refer to [Section 303-00](#) .

58. Install the Cylinder Head Remover/Installer on both ends of the cylinder head.



### RH cylinder head

59. **NOTICE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.

**NOTICE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.

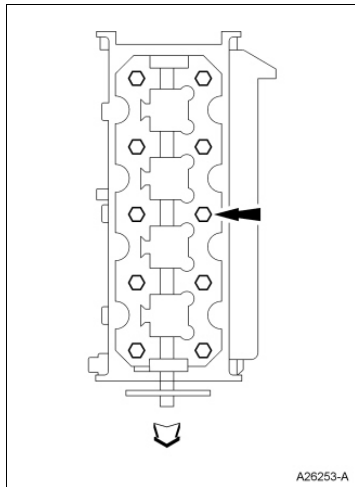
**NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.

**NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

Remove the bolts and the RH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



### LH cylinder head

60. **NOTICE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.

**NOTICE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.

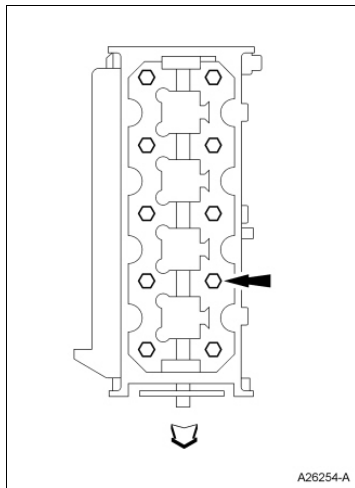
**NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.

**NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

Remove the bolts and the LH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



### Both cylinder heads

61. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.

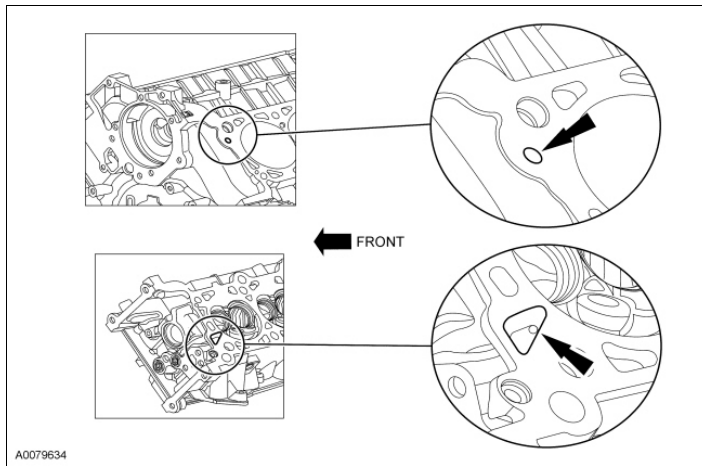
**NOTE:** If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block in the following sequence.

1. Remove any large deposits of silicone or gasket material with a plastic scraper.
2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any remaining traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.



62. **NOTE:** LH shown, RH similar.

Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion, paying particular attention to the oil pressure feed area. For additional information, refer to Section 303-00.



**Engine**

## Special Tool(s)

 ST2443-A	<b>Lifting Bracket Set, Engine</b> <b>303-DS086 (D93P-6001-A)</b>  Includes Lifting Bracket, Engine 303-D087 and 303-D088 or equivalent
 ST1448-A	<b>Socket, Exhaust Gas Oxygen Sensor</b> <b>303-476 (T94P-9472-A)</b>

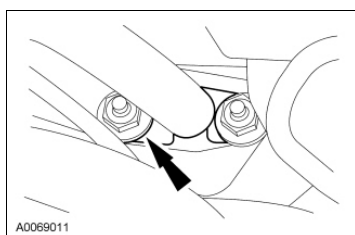
## Material

Item	Specification
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information refer to [Section 100-02A](#) .

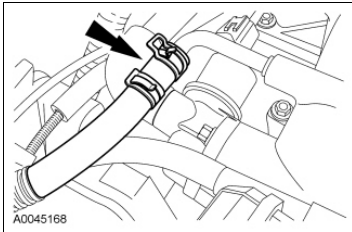
2. Release the fuel pressure. For additional information, refer to [Section 310-00](#) .
3. Remove the hood.
4. Disconnect both battery cables. For additional information, refer to [Section 414-01](#) .
5. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to [Section 303-12](#) .
6. Remove the wiper mounting arm and pivot shaft. For additional information, refer to [Section 501-16](#) .
7. Remove the 2 nuts and the support bracket.



8. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#) .

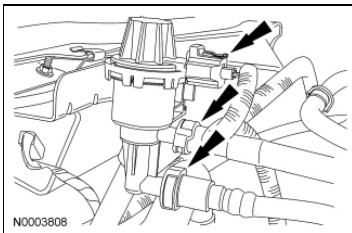
9. Drain the engine cooling system. For additional information, refer to [Section 303-03](#).

10. Disconnect the vacuum hose.



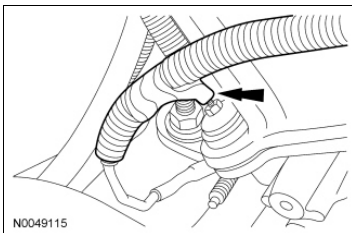
11. Disconnect the Evaporative Emission (EVAP) canister purge valve.

- Disconnect the 2 quick release EVAP hoses.
- Disconnect the electrical connector.



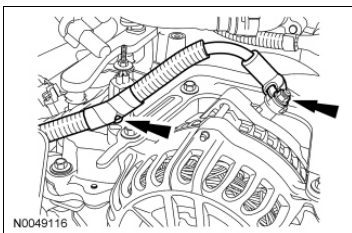
12. Disconnect the fuel tube spring lock coupling. For additional information, refer to [Section 310-00](#).

13. Detach the generator battery cable retainer from the RH valve cover stud bolt.

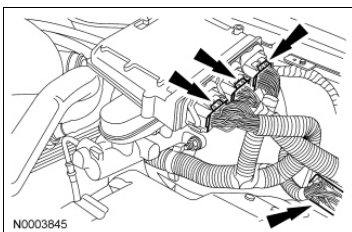


14. Remove the nut and disconnect the generator battery cable.

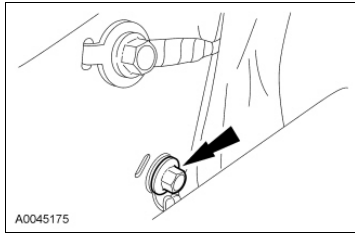
- Detach the generator battery cable pin-type retainer.



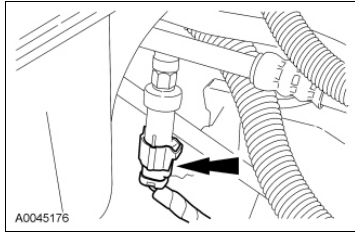
15. Disconnect the PCM electrical connectors.



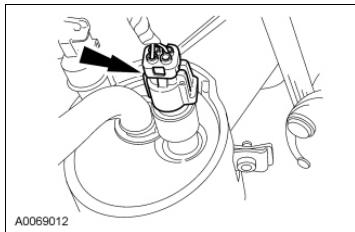
16. Remove the bolt and ground wire.



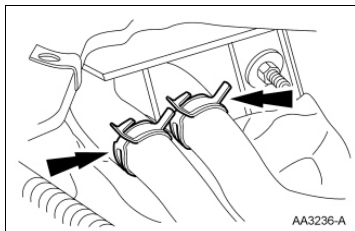
17. Disconnect the A/C electrical connector.



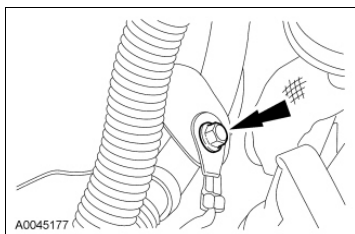
18. Disconnect the A/C low charge protection switch electrical connector.



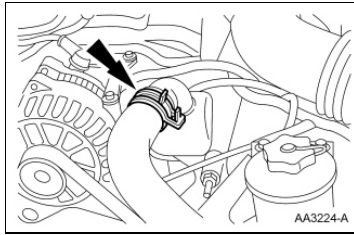
19. Disconnect the heater hoses.



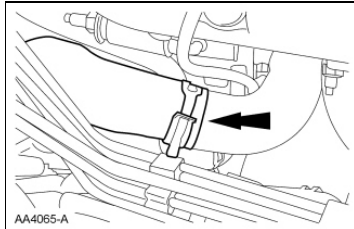
20. Remove the bolt and the ground strap.



21. Disconnect the upper radiator hose from the hose connection. Secure the hose to the radiator assembly.



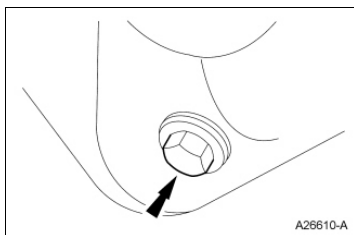
22. Disconnect the lower radiator hose from the oil filter adapter.



23. Remove the cooling fan. For additional information, refer to [Section 303-03](#) .

24. Drain the engine oil.

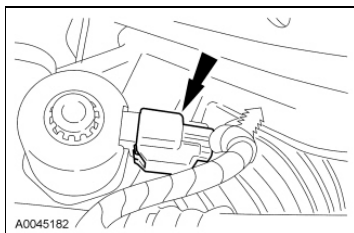
- Install the drain plug when finished.
- To install, tighten to 23 Nm (17 lb-ft).



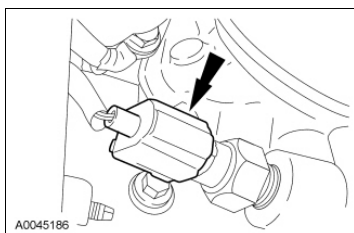
25. Remove and discard the oil filter.

26. If equipped, disconnect the block heater electrical connector.

27. Disconnect the power steering electrical connector.

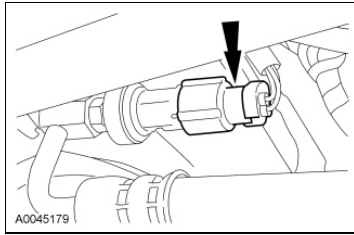


28. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.



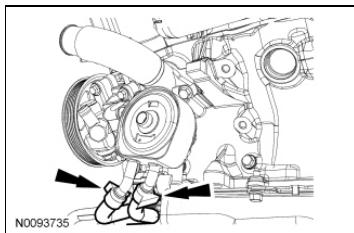
29. Disconnect the Power Steering Pressure (PSP) switch electrical connector.



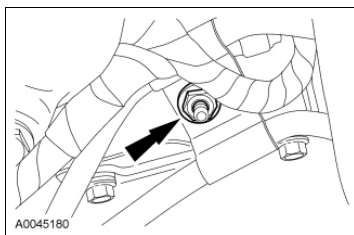


30. **NOTICE:** For correct installation, the white lines on the coolant hoses must be aligned with the black dots on the oil cooler tubes. If the black dots are not visible, mark the oil cooler tube with a permanent marker before disconnecting the hoses. Failure to follow this instruction may result in damage to the coolant hoses.

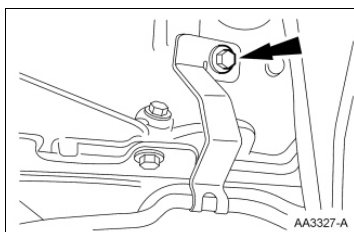
If equipped, disconnect the 2 coolant hoses from the oil cooler.



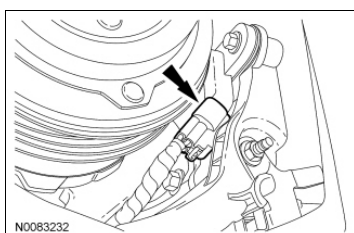
31. Remove the nut and the transmission cooler tube support bracket.



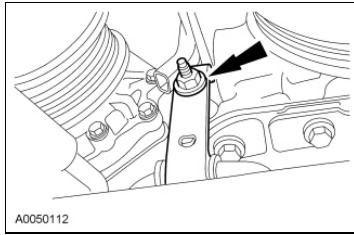
32. Remove the transmission oil cooler tube bracket bolt.



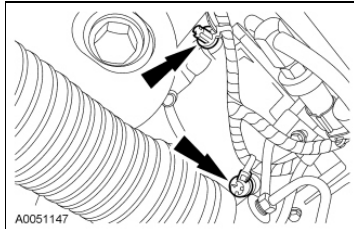
33. Disconnect the Crankshaft Position (CKP) sensor electrical connector.



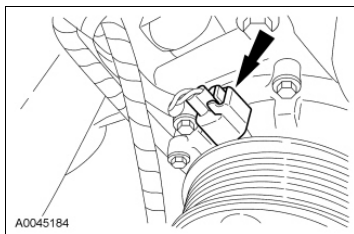
34. Position the power steering tube bracket aside.



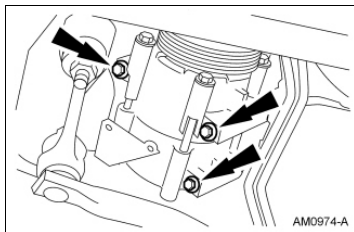
35. Disconnect the engine wiring harness retainers from the A/C compressor.



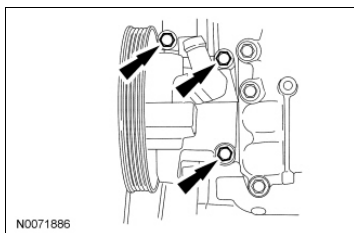
36. Disconnect the A/C compressor electrical connector.



37. Remove the 3 bolts and position the A/C compressor aside.

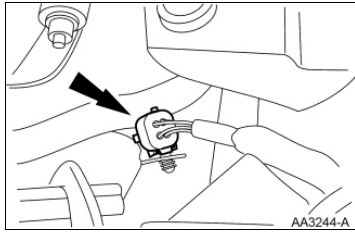


38. Remove the 3 bolts and position the power steering pump aside.

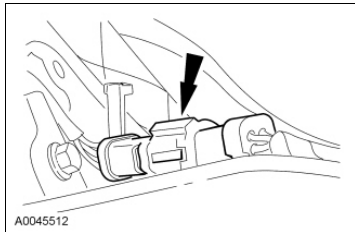


39. Remove the starter motor. For additional information, refer to [Section 303-06](#) .

40. Disconnect the RH Heated Oxygen Sensor (HO2S) electrical connectors.

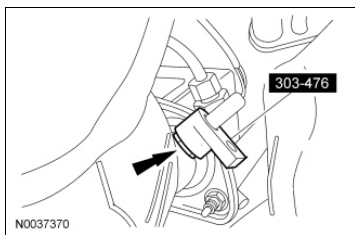


41. Disconnect the LH HO2S electrical connector.

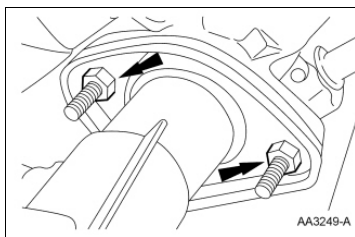


42. **NOTE:** If necessary, lubricate the sensor threads with penetrating and lock lubricant to assist in removal.

Using the Exhaust Gas Oxygen Sensor Socket, remove the LH HO2S .

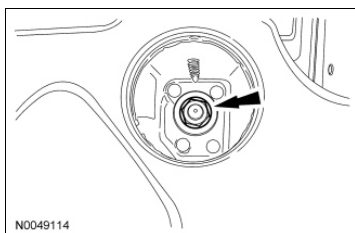


43. Support the exhaust and remove the 4 nuts.  
• Discard the 4 nuts.



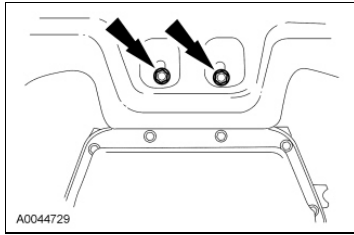
44. **NOTE:** LH shown, RH similar.

Remove the 2 engine mount nuts.

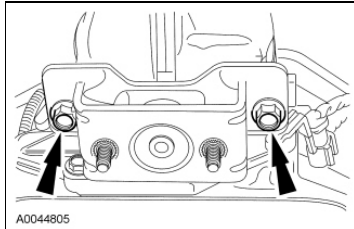


45. Install a suitable lifting device under the transmission and support.

46. Remove the rear transmission insulator nuts.

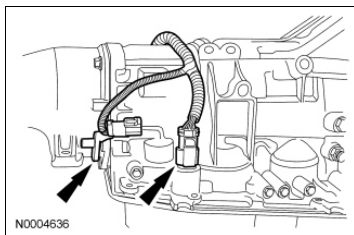


47. Raise the transmission and remove the rear transmission insulator bolts.

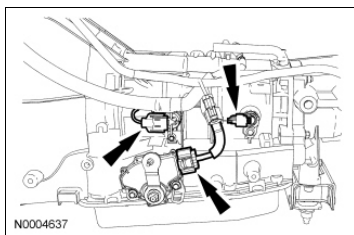


48. Remove the transmission rear insulator and lower the transmission down to rest on the rear crossmember.

49. Disconnect the HO2S sensor and the solenoid body sensor electrical connectors.

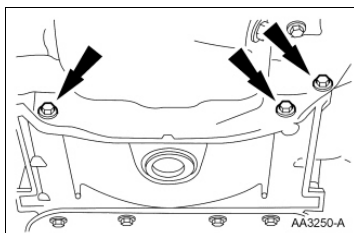


50. Disconnect the Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor and the Turbine Shaft Speed (TSS) sensor electrical connectors.

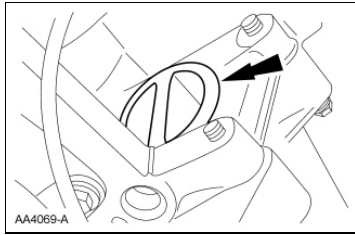


51. Release the wiring harness from the retainers on the transmission.

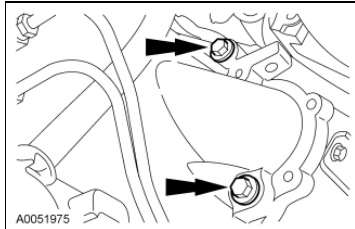
52. Remove the 3 bolts and the inspection cover.



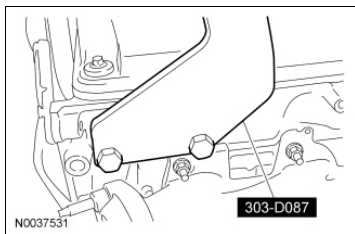
53. Remove the torque converter nut access plug.  
• Remove the 4 nuts.



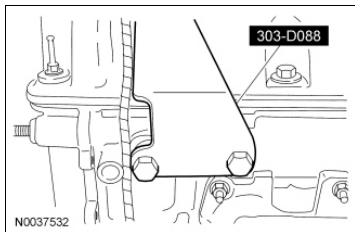
54. Remove the 4 bolts and 1 stud (2 bolts shown).



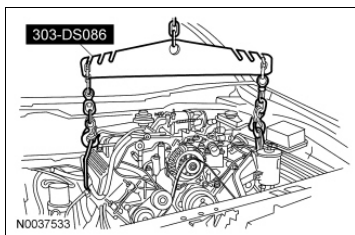
55. Install the Engine Lifting Bracket to the RH cylinder head.



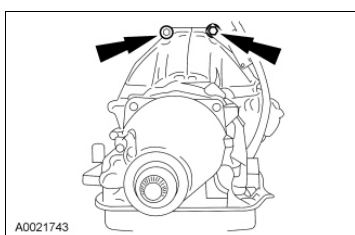
56. Install the Engine Lifting Bracket to the LH cylinder head.



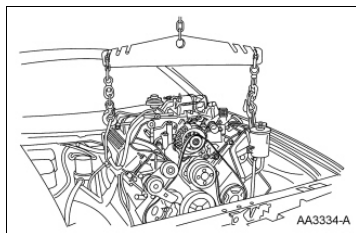
57. Install the Engine Lifting Bracket Set.



58. Remove the 2 bellhousing bolts.



59. Remove the engine assembly from the vehicle.







SECTION 303-01: Engine - 4.6L (2V)  
DISASSEMBLY

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

## Engine

### Special Tool(s)

 ST1330-A	Compressor, Valve Spring 303-567 (T97P-6565-AH)
 ST1276-A	Cylinder Ridge Reamer 303-016 (T64L-6011-EA)
 ST1337-A	Installer, Connecting Rod 303-442 (T93P-6136-A)
 ST2443-A	Lifting Bracket Set, Engine 303-DS086 (D93P-6001-A)  Includes Lifting Bracket, Engine 303-D087 and 303-D088 or equivalent
 ST1732-A	Remover, Crankshaft Front Oil Seal 303-107 (T74P-6700-A)
 ST1382-A	Remover, Crankshaft Rear Oil Seal 303-519 (T95P-6701-EH)
 ST1481-A	Remover, Crankshaft Rear Oil Slinger 303-514 (T95P-6701-AH)
 ST1286-A	Remover, Crankshaft Vibration Damper 303-009 (T58P-6316-D)
 ST1668-A	Remover/Installer, Cylinder Head 303-572 (T97T-6000-A)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1331-A	Spacer, Valve Spring Compressor 303-382 (T91P-6565-AH)

### Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-

Silicone Gasket Remover ZC-30	-
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## Disassembly

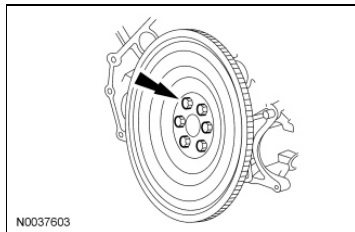
**NOTICE:** Servicing the bottom end of the engine (crankshaft, bearings) requires that cylinder heads be removed. Failure to do so may result in engine damage.

**NOTICE:** During engine repair procedures, cleanliness is extremely important. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages, coolant passages or the oil pan may cause engine failure.

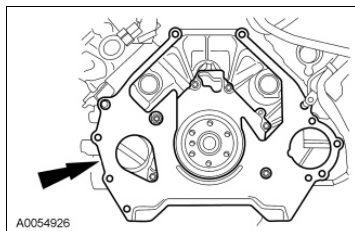
**NOTE:** The crankshaft rear seal, the rear oil seal slinger and the crankshaft rear seal retainer plate must be removed before mounting the engine on the engine stand.

**NOTE:** For additional information, refer to the exploded views under engine Assembly in this section.

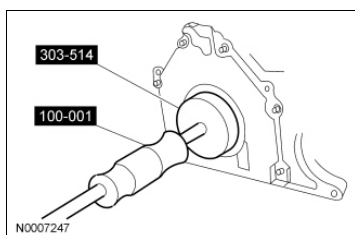
1. Remove the 6 bolts and the flexplate.



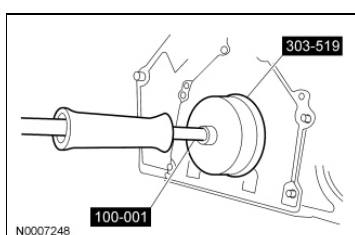
2. Remove the engine/transmission spacer plate.



3. Using the Crankshaft Rear Oil Slinger Remover and Slide Hammer, remove the crankshaft rear seal slinger.

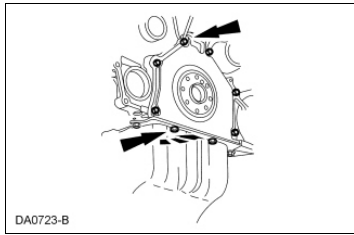


4. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove the crankshaft rear seal.

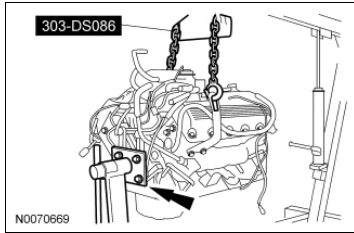




5. Remove the 2 oil pan-to-crankcase rear seal retainer plate bolts and the 6 crankcase rear seal retainer plate bolts.

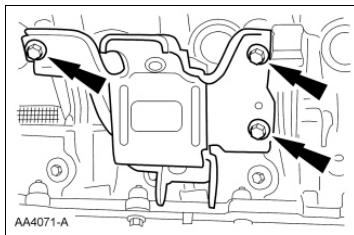


6. Using the Engine Lifting Bracket Set, mount the engine on a suitable engine stand.



7. **NOTE:** RH shown, LH similar.

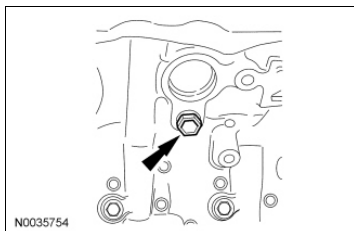
Remove the bolts and the LH and RH engine mounts.



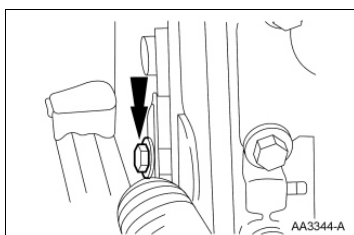
8. **NOTE:** LH shown, RH similar.

If equipped, remove the drain plugs from the engine block. Allow the coolant to completely drain.

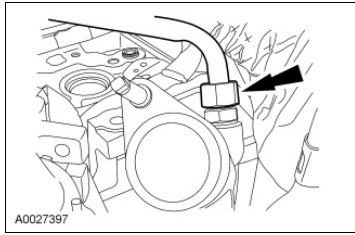
- Install the drain plugs when finished.
- To install, tighten to 20 Nm (177 lb-in).



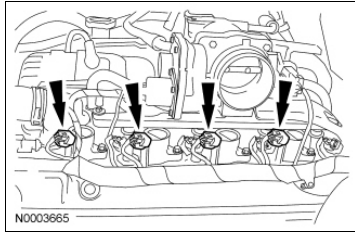
9. Remove the bolt and the battery cables from the engine.



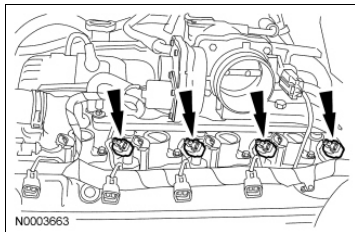
10. Disconnect the EGR tube from the exhaust manifold.



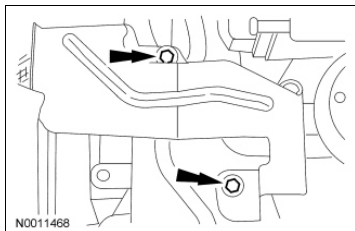
11. Disconnect the 8 ignition coil electrical connectors (4 shown).



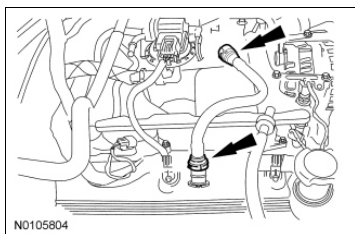
12. Disconnect the 8 fuel injector electrical connectors (4 shown).



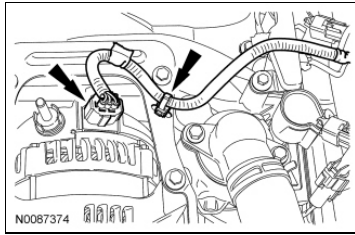
13. Remove the 2 bolts and the intake manifold shield.



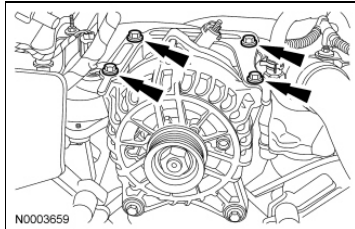
14. Disconnect and remove the crankcase ventilation tube.



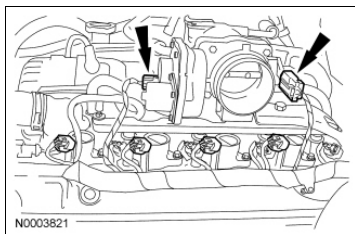
15. Disconnect the generator electrical connector and detach the wiring harness retainer.



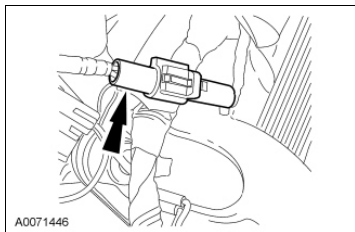
16. Remove the 4 generator mounting bracket bolts and the bracket.



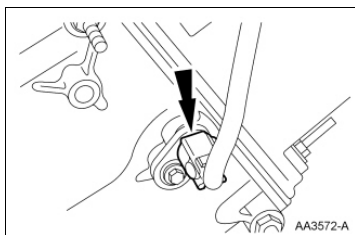
17. Disconnect the throttle control and the Throttle Position (TP) sensor electrical connectors.



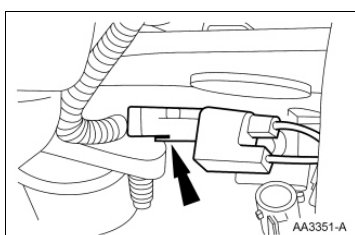
18. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.



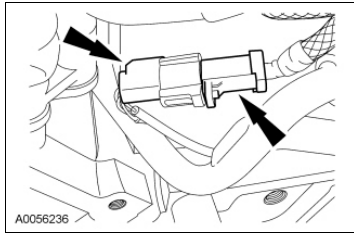
19. Disconnect the Camshaft Position (CMP) sensor electrical connector.



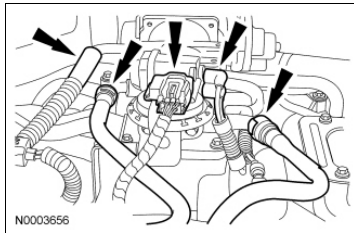
20. Disconnect the radio ignition interference capacitor and remove the engine control sensor wiring.



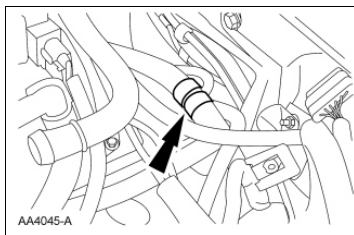
21. Disconnect the Knock Sensor (KS) electrical connector and the wiring harness pin-type retainer.



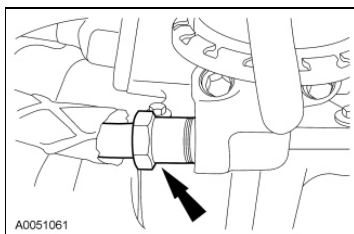
22. Disconnect the vacuum hoses and the electrical connector.



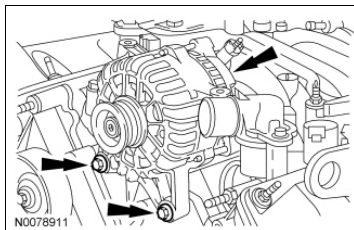
23. Disconnect the fuel charging wiring from the intake manifold crash bracket and remove the harness from the engine assembly.



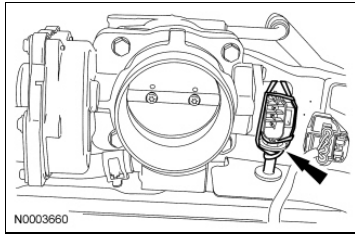
24. Disconnect the EGR tube nut from the EGR valve.



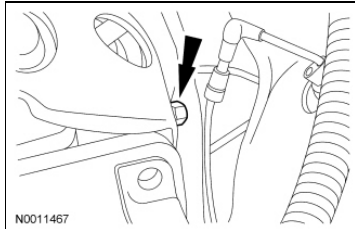
25. Remove the 2 generator bolts and the generator.



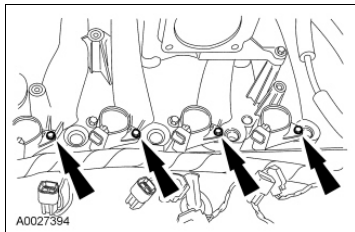
26. Remove the intake manifold crash bracket bolt and prevent the bolt from contacting the cylinder head with a rubber band or tie strap.



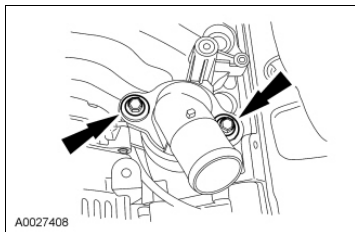
27. Remove the intake manifold crash bracket stud bolt.



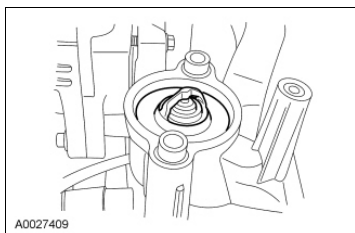
28. Remove the 8 bolts and the 8 ignition coils (4 shown).



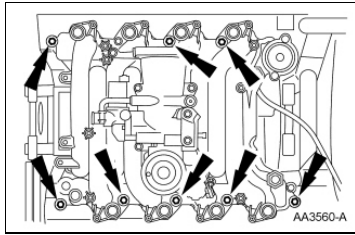
29. Remove the 2 bolts and the coolant outlet adapter.



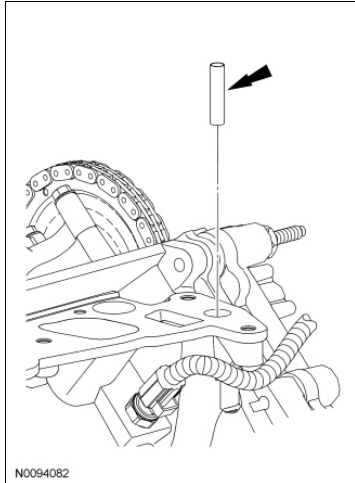
30. Remove the thermostat.



31. Remove the 8 bolts and the intake manifold.  
• Discard the intake manifold gaskets.

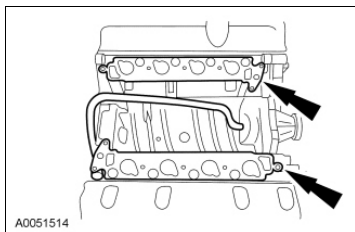


32. Remove the cylinder head insert from the LH cylinder head.



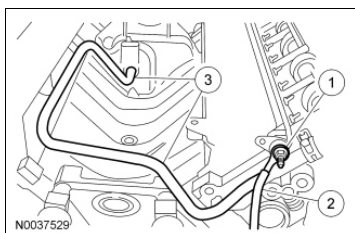
33. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

Clean the sealing surfaces.

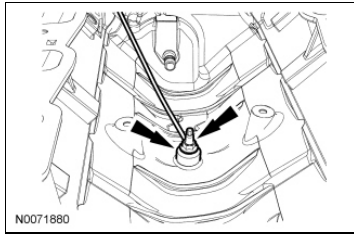


34. Remove the coolant bypass tube.

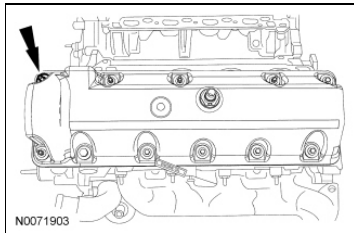
1. Remove the retaining nut.
2. Remove the ground strap.
3. Remove the coolant bypass tube.



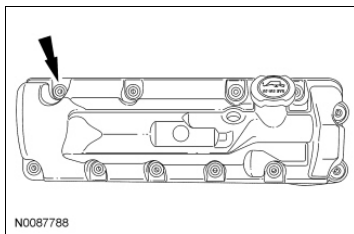
35. Remove the nut and the KS .



36. Loosen the 6 studs and 5 bolts and remove the LH valve cover.
- Discard the gasket.



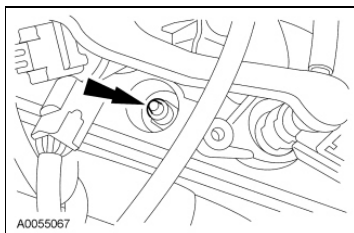
37. Loosen the 7 studs and 4 bolts and remove the RH valve cover.
- Discard the gasket.



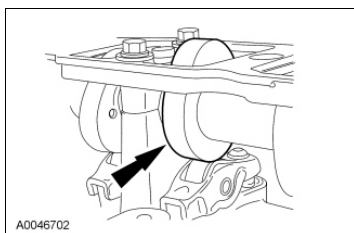
38. **NOTICE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.

**NOTE:** Use compressed air to remove any foreign material from the spark plug well before removing the spark plugs.

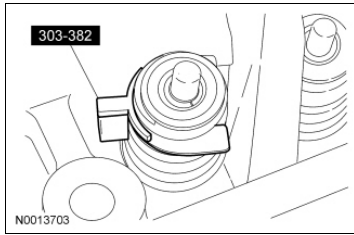
Remove the 8 spark plugs.



39. Position the lobe of the camshaft upward.

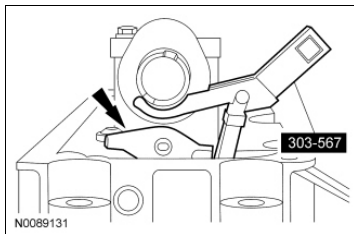


40. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



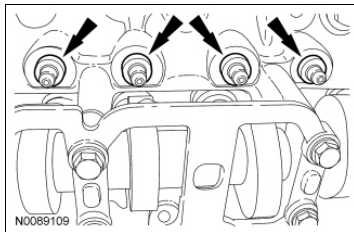
41. **NOTICE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.

Using the Valve Spring Compressor, compress the valve springs and remove the 16 camshaft roller followers.

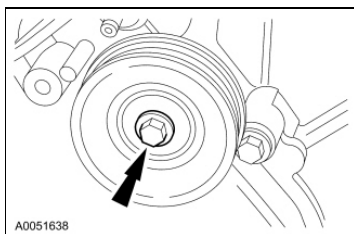


42. **NOTICE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.

Remove the 16 hydraulic lash adjusters (4 shown).

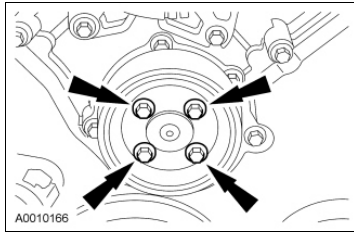


43. Remove the bolt and the accessory drive belt idler pulley.

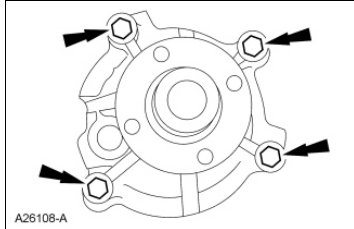


44. Remove the 4 bolts and the coolant pump pulley.

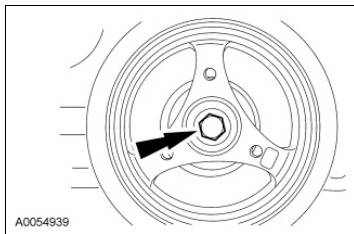




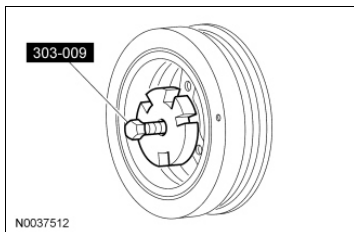
45. Remove the 4 bolts and the coolant pump.



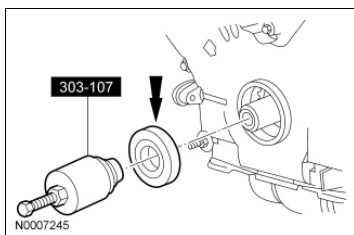
46. Remove the crankshaft pulley bolt.



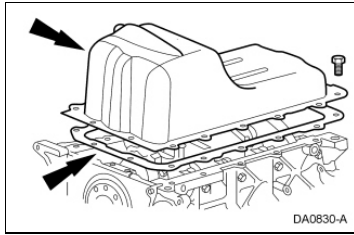
47. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley.



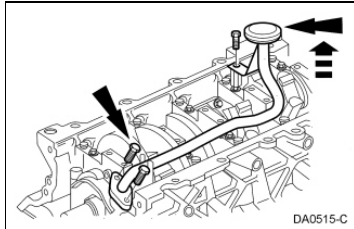
48. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft front seal.



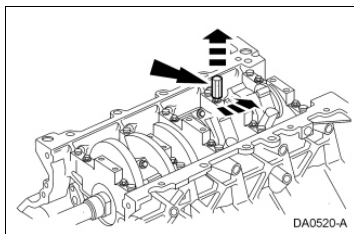
49. Remove the 16 bolts and the oil pan.  
• Discard the gasket.



50. Remove the 3 bolts, the oil pump screen and pickup tube.

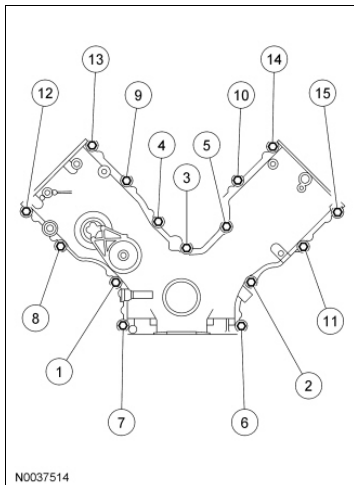


51. Remove the oil pump screen and pickup tube spacer.

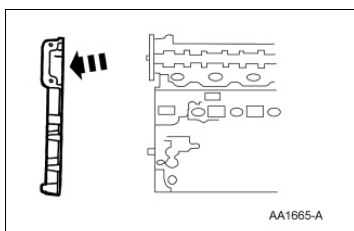


52. **NOTE:** Correct fastener location is essential for the assembly procedure. Record fastener location.

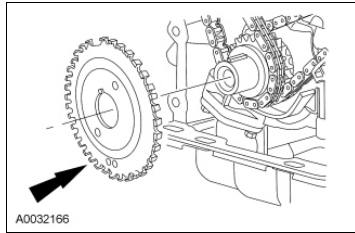
Remove the 15 fasteners in the sequence shown.



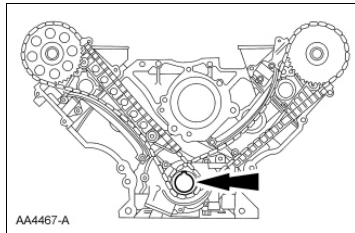
53. Remove the engine front cover from the cylinder block.



54. Remove the crankshaft sensor ring from the crankshaft.

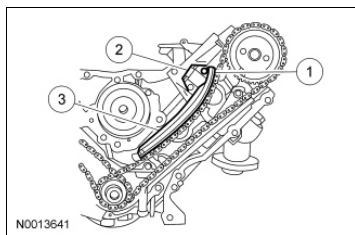


55. Position the crankshaft with the keyway at the 12 o'clock position.



56. Remove the timing chain tensioning system from both timing chains.

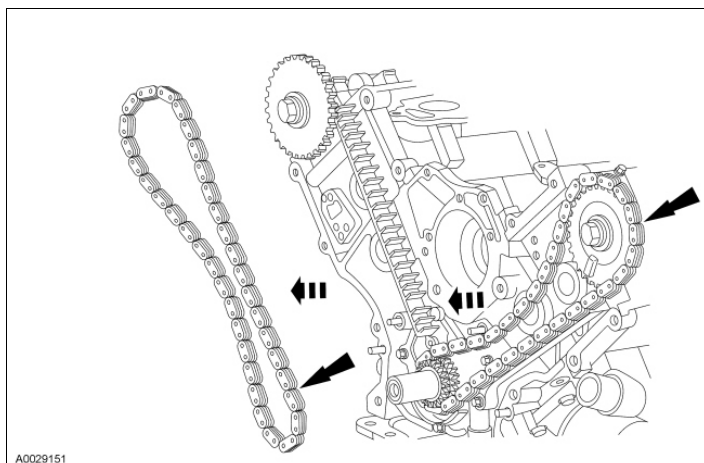
1. Remove the 4 bolts.
2. Remove the timing chain tensioners.
3. Remove the timing chain tensioner arms.



57. **NOTICE:** Unless otherwise instructed, at no time when the timing chains are removed and the cylinder heads are installed is the crankshaft or camshaft to be rotated. Severe piston and valve damage will occur.

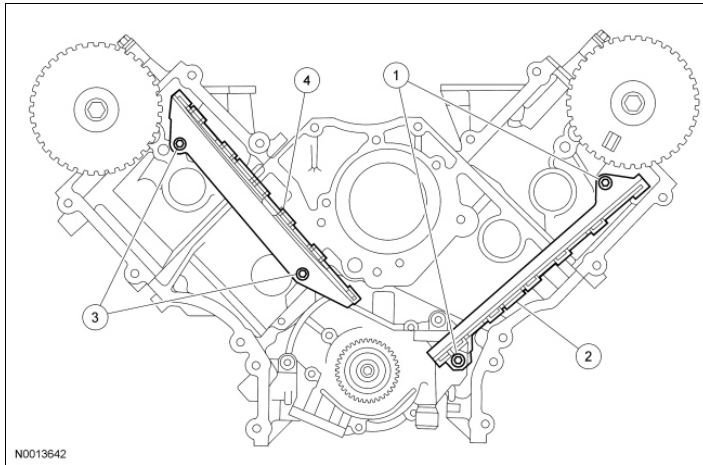
Remove the LH and RH timing chains and the crankshaft sprocket.

- Remove the RH timing chain from the camshaft sprocket.
- Remove the RH timing chain from the crankshaft sprocket.
- Repeat for the LH timing chain and crankshaft sprocket.



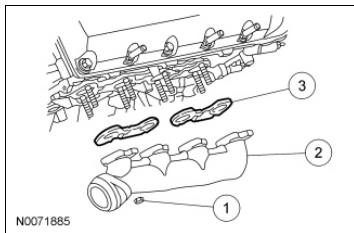
58. Remove both timing chain guides.

1. Remove the 4 bolts.
2. Remove the LH timing chain guide.
3. Remove the bolts.
4. Remove the RH timing chain guide.



59. Remove the RH exhaust manifold.

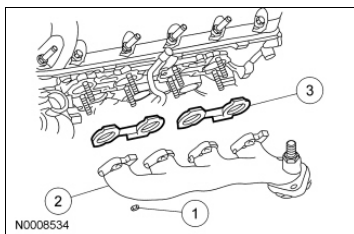
1. Remove the 8 nuts and discard.
2. Remove the RH exhaust manifold.
3. Remove the RH exhaust manifold gasket and discard.



60. Remove and discard the 8 RH exhaust manifold studs.

61. Remove the LH exhaust manifold.

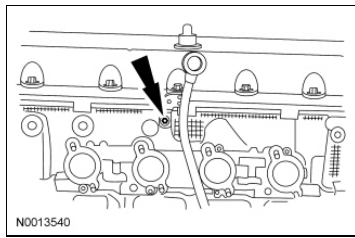
1. Remove the 8 nuts and discard.
2. Remove the LH exhaust manifold.
3. Remove the LH exhaust manifold gaskets and discard.



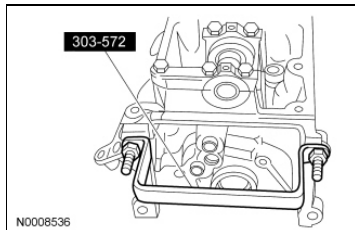
62. Remove and discard the 8 LH exhaust manifold studs.

63. Clean and inspect the exhaust manifolds. For additional information, refer to [Section 303-00](#).

64. Remove the bolt and the oil level indicator tube.



65. Install the Cylinder Head Remover/Installer on both ends of the cylinder head.



66. **NOTICE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.

**NOTICE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.

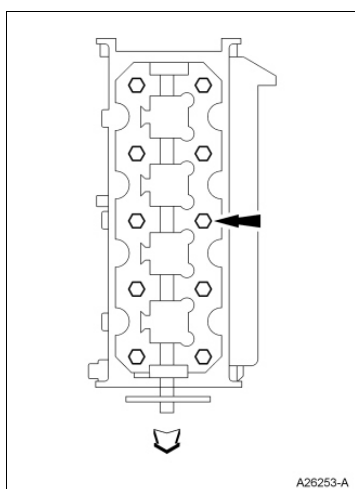
**NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.

**NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

Remove the 10 bolts and the RH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



67. **NOTICE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.

**NOTICE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.

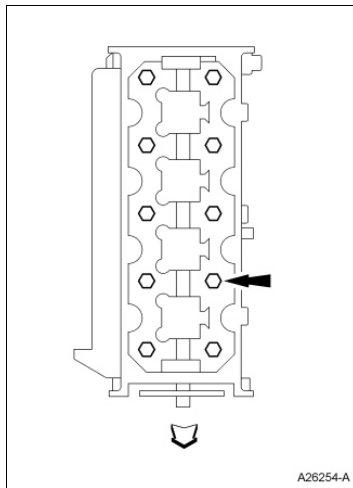
**NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.

**NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

Remove the 10 bolts and the LH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



68. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.

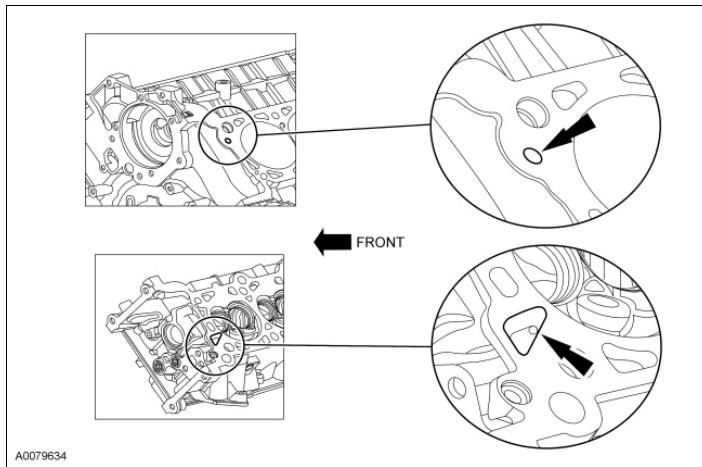
**NOTE:** If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

Clean the cylinder head-to-cylinder block mating surfaces of both cylinder heads and the cylinder block in the following sequence.

1. Remove any large deposits of silicone or gasket material with a plastic scraper.
2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any remaining traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.

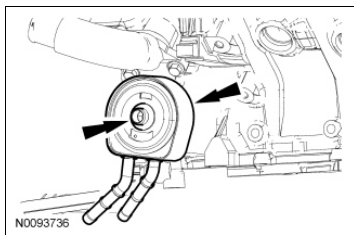
69. **NOTE:** LH shown, RH similar.

Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion paying particular attention to the oil pressure feed area. For additional information, refer to Section 303-00 .



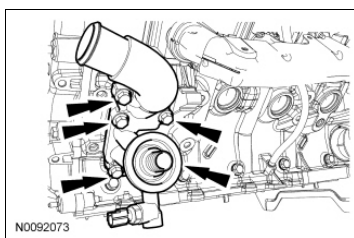
70. **NOTICE:** The oil cooler must be replaced or severe damage to the engine can occur.

If equipped, remove the oil cooler mounting bolt and remove and discard the oil cooler.

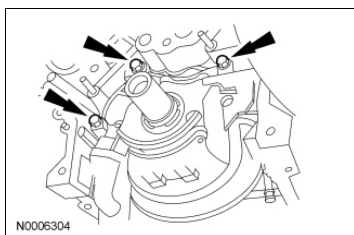


71. Remove the 4 bolts and the oil filter adapter.

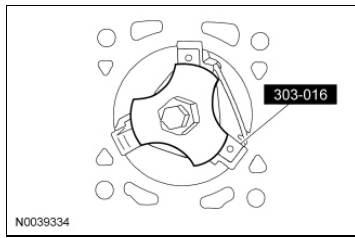
- Discard the gasket.



72. Remove the 3 oil pump bolts and the oil pump.



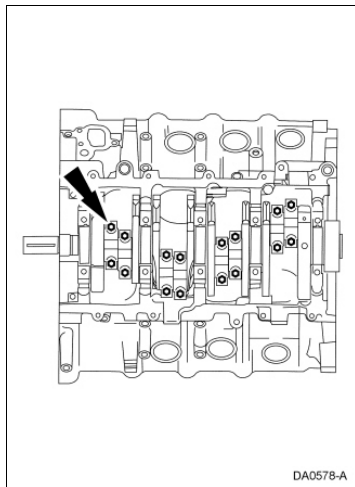
73. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using a Cylinder Ridge Reamer, following the manufacturer instructions.



74. **NOTE:** Verify that the connecting rods and rod caps have orientation numbers cast into them. If not, number the connecting rods and rod caps for correct orientation.

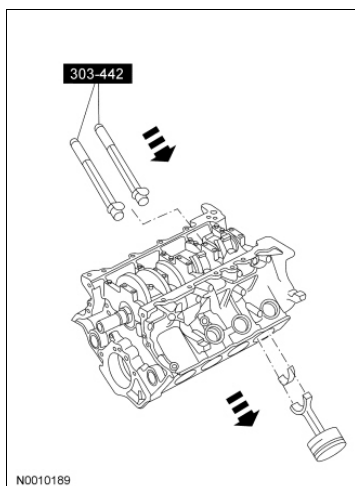
Remove the 2 bolts and the connecting rod cap.

- Discard the bolts.



75. **NOTE:** Do not scratch the cylinder walls or crankshaft journals with the connecting rod.

Using the Connecting Rod Installer, push the piston through the top of the cylinder block.



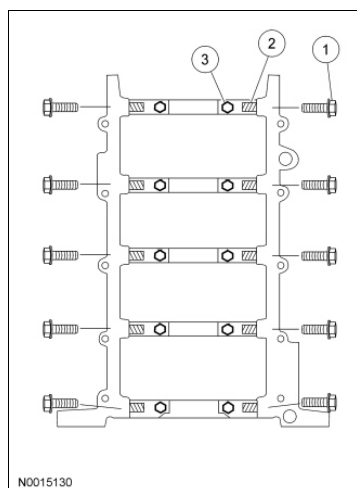
76. **NOTICE:** Servicing the bottom end of the engine (crankshaft, bearings) requires that cylinder heads be removed. Failure to do so may result in engine damage.

Remove the crankshaft bearing cap fasteners.

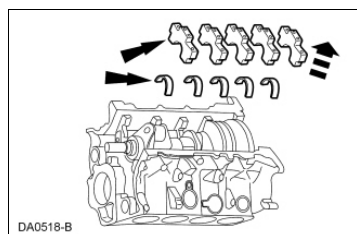
1. Remove and discard the 10 cross-mounted main cap bolts.



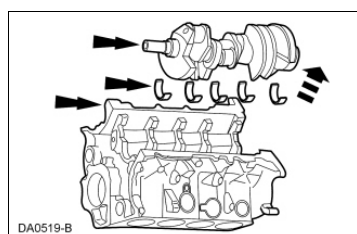
2. Loosen the 10 jack screws.
3. Remove and discard the 10 main cap bolts.



77. Remove the 5 main bearing caps and the lower crankshaft main bearings.



78. Remove the crankshaft and the upper crankshaft main bearings from the cylinder block.








## SECTION 303-01: Engine - 4.6L (2V)

2010 Crown Victoria, Grand Marquis  
Workshop ManualDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

Procedure revision date: 08/19/2009

**Cylinder Head**

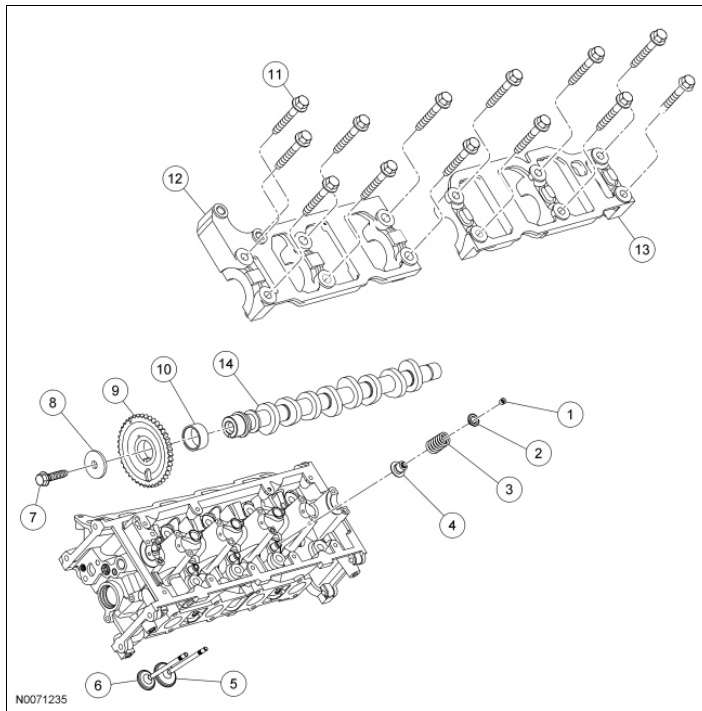
## Special Tool(s)

 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-567 (T97P-6565-AH)
 ST1332-A	Installer, Valve Stem Oil Seal 303-383 (T91P-6571-A)

## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**NOTE:** LH shown, RH similar.



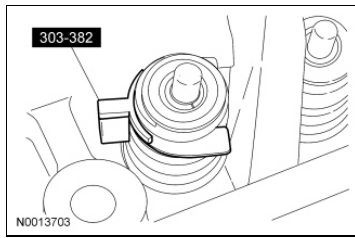
Item	Part Number	Description
1	6518	Valve spring retainer key (16 required)
2	6514	Valve spring retainer (8 required)
3	6513	Valve spring (8 required)
4	6A517	Valve stem seal (8 required)
5	6505	Intake valve (4 required)
6	6507	Exhaust valve (4 required)
7	N811085	Camshaft sprocket bolt
8	N806164	Camshaft sprocket bolt washer
9	6256	Camshaft sprocket
10	6265	Camshaft sprocket spacer
11	N807352	Camshaft bearing cap bolt (13 required)
12	6B280	Camshaft bearing cap
13	6B280	Camshaft bearing cap
14	6A274	Camshaft

### Disassembly

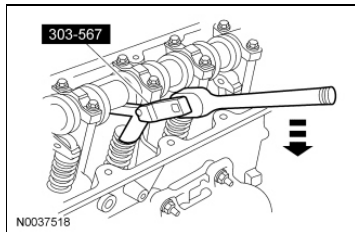
1. **NOTICE:** Place cylinder head on a cardboard or wood surface to prevent damage to the joint face.

**NOTE:** Do not remove the camshaft before removing the roller followers.

Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.

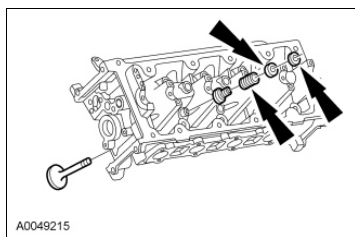


2. Using the Valve Spring Compressor, compress the valve springs.

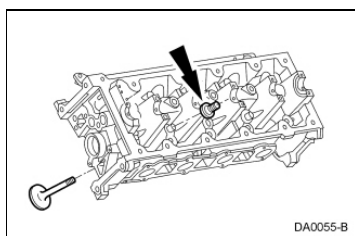


3. **NOTE:** Keep valves and valve spring retainer keys in order so they can be installed in their original positions.

Remove the valve spring retainer keys, the valve spring retainers, the valve springs and the valves.

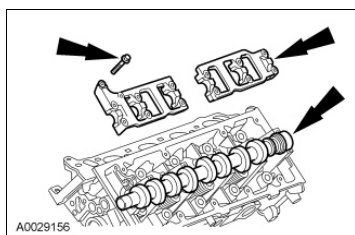


4. Remove the valve stem seals.



5. **NOTE:** The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations.

Remove the bolts, the bearing caps and the camshaft.

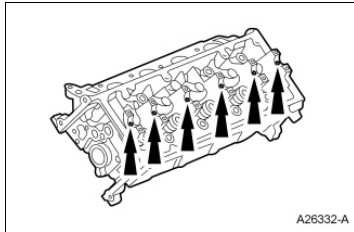


## Assembly

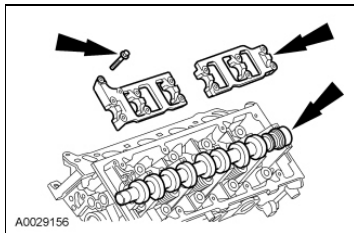
1. **NOTE:** Do not use metal scrapers or other tools to clean the cylinder head.

Use a plastic scraper and metal surface prep to clean the cylinder head.

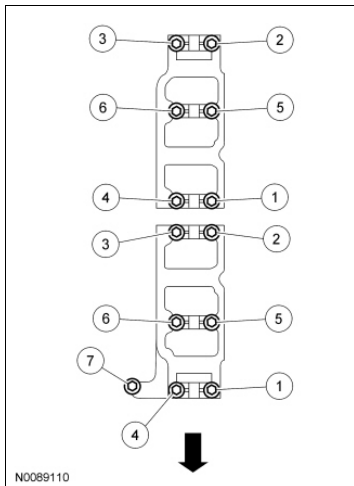
2. Lubricate the camshaft journals with clean engine oil.



3. Install the camshaft and the camshaft bearing caps.
  - Lubricate with clean engine oil and position the camshaft bearing caps.
  - Install the bolts loosely.

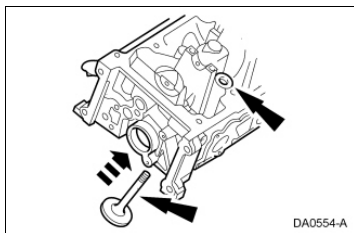


4. Tighten the camshaft bearing caps bolts in the sequence shown.
  - Tighten to 10 Nm (89 lb-in).



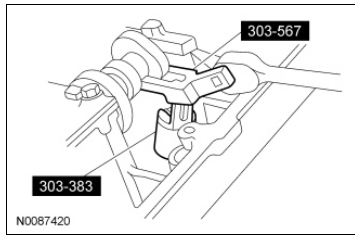
5. **NOTE:** Lubricate the valve stems with clean engine oil.

Install the valves in the cylinder head.

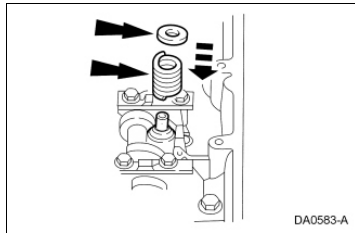


6. **NOTE:** Lubricate the valve stems seals with clean engine oil.

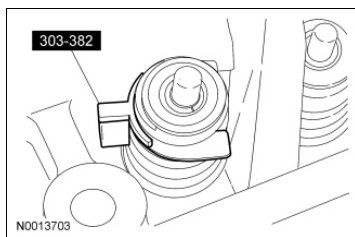
Using the Valve Stem Oil Seal Installer and Valve Spring Compressor, install the valve stem seals.



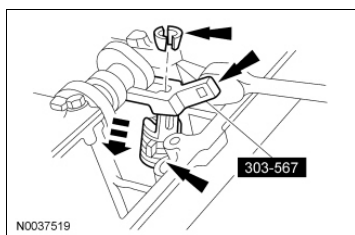
7. Install the valve springs and the valve spring retainers onto the valves.



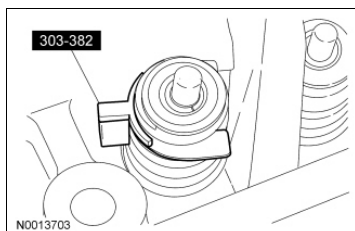
8. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



9. Using the Valve Spring Compressor, compress the valve springs and install the valve spring retainer keys.



10. Remove the Valve Spring Compressor Spacer.



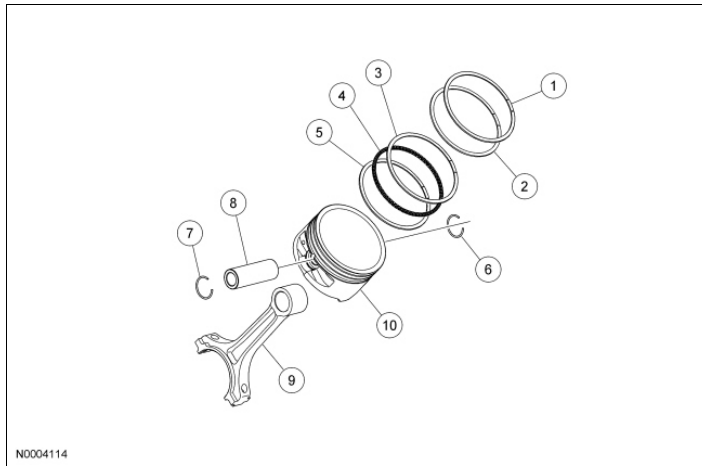




**Piston**

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A



N0004114

Item	Part Number	Description
1	6150	Piston compression upper ring
2	6152	Piston compression lower ring
3	6159	Piston oil control upper segment ring
4	6161	Piston oil control spacer
5	6159	Piston oil control lower segment ring
6	6140	Piston pin retainer
7	6140	Piston pin retainer
8	6135	Piston pin
9	6200	Connecting rod
10	6110	Piston

**Disassembly**

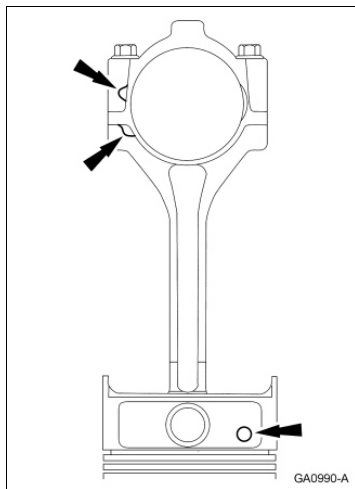
1. Remove the upper piston compression ring.
2. Remove the lower piston compression ring.
3. Remove the upper piston oil control segment ring.

4. Remove the piston oil control spacer.
5. Remove the lower piston oil control segment ring.
6. Remove the 2 piston pin retainers.
7. Remove the piston pin and remove the connecting rod from the piston.

### Assembly

1. **NOTE:** Connecting rod must be installed into piston with identification markings toward front.

Position the connecting rod in the piston.



2. **NOTE:** Lubricate the piston pin and retainers with clean engine oil.

Install the piston pin and the 2 piston pin retainers.

3. **NOTE:** Lubricate all the piston rings and piston oil control spacer with clean engine oil.

Install the lower piston oil control segment ring.

4. Install the piston oil control spacer.
  5. Install the upper piston oil control segment ring.
  6. Install the lower piston compression ring.
  7. Install the upper piston compression ring.
-



**Engine**

## Special Tool(s)

 ST1376-A	Compressor, Piston Ring 303-D032 (D81L-6002-C) or equivalent
 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-567 (T97P-6565-AH)
 ST1335-A	Holding Tool, Crankshaft 303-448 (T93P-6303-A)
 ST1337-A	Installer, Connecting Rod 303-442 (T93P-6136-A)
 ST2197-A	Installer, Crankshaft Front Oil Seal 303-635
 ST1480-A	Installer, Crankshaft Rear Oil Seal 303-518 (T95P-6701-DH)
 ST1479-A	Installer, Crankshaft Rear Oil Seal 303-516 (T95P-6701-BH)
 ST1482-A	Installer, Crankshaft Rear Oil Slinger 303-517 (T95P-6701-CH)
 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST2443-A	Lifting Bracket Set, Engine 303-DS086 (D93P-6001-A)  Includes Lifting Bracket, Engine 303-D087 and 303-D088 or equivalent
 ST1668-A	Remover/Installer, Cylinder Head 303-572 (T97T-6000-A)

 ST143B-A	<b>Strap Wrench</b> 303-D055 (D85L-6000-A) or equivalent
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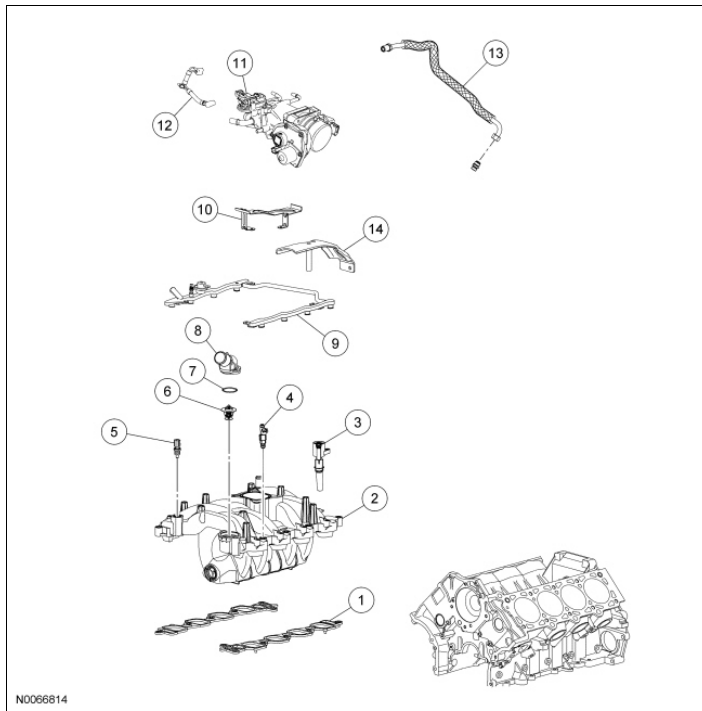
#### General Equipment

<b>Hydraulic Chain Tensioner Retaining Clip -</b> 1L3Z-6P250-AA
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#### Material

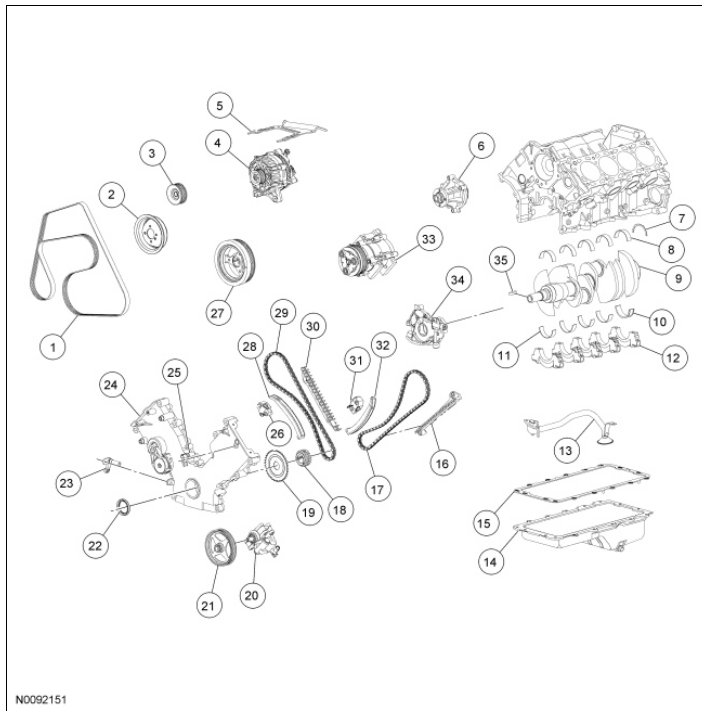
Item	Specification
Gasket Maker TA-16	WSK-M2G348-A5
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-

#### Engine Induction System



Item	Part Number	Description
1	9439	Intake manifold gasket (2 required)
2	9424	Intake manifold
3	12A366	Ignition coil (8 required)
4	9F593	Fuel injector (8 required)
5	10884	Engine Coolant Temperature (ECT) sensor
6	8575	Coolant thermostat
7	N806807	O-ring seal
8	8594	Coolant outlet adapter
9	9F792	Fuel rail
10	9F460	Intake manifold shield
11	9E822	Throttle Body (TB)
12	9E498	Vacuum harness
13	9D477	EGR-to-exhaust manifold tube
14	9G609	Intake manifold bracket

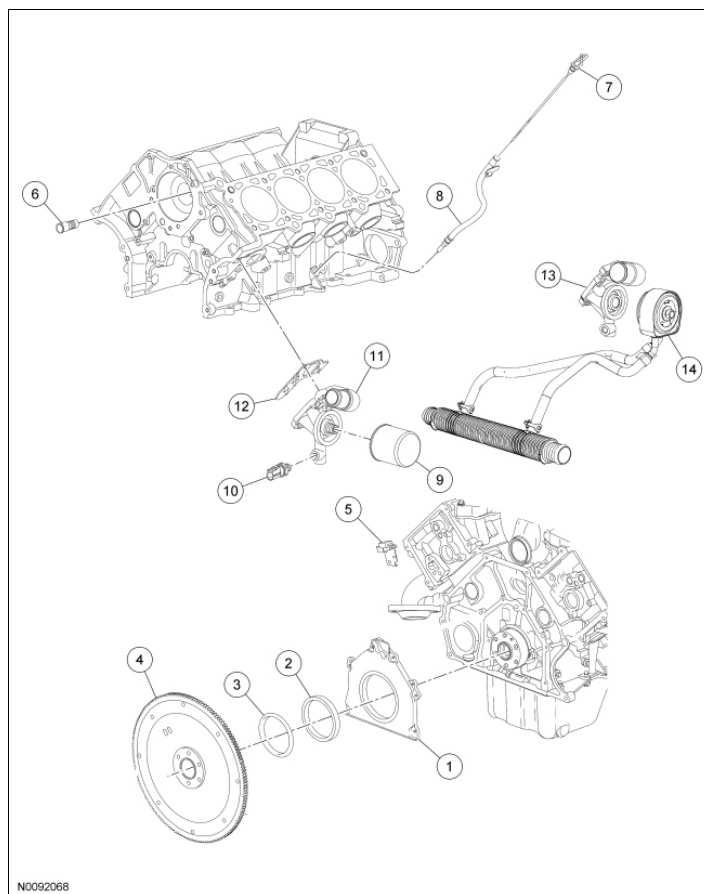
#### Engine - Front End and Lower End



Item	Part Number	Description
1	8620	Accessory drive belt
2	8A528	Coolant pump pulley
3	19A216	Idler pulley
4	10300	Generator
5	10153	Generator bracket
6	8501	Coolant pump
7	6A341	Crankshaft thrust washer
8	6333	Crankshaft main bearing (5 required)
9	6303	Crankshaft
10	6A339	Crankshaft thrust main bearing
11	6A338	Crankshaft main bearing (4 required)
12	6325	Main bearing cap (5 required)
13	6622	Oil pump screen cover and tube
14	6675	Oil pan
15	6710	Oil pan gasket
16	6B274	Timing chain guide
17	6268	Timing chain
18	6306	Crankshaft sprocket
19	12A227	Ignition pulse ring
20	3A674	Power steering pump
21	3D673	Power steering pump pulley
22	6700	Crankshaft front seal
23	6C315	Crankshaft position sensor
24	6C086	Engine front cover
25	6B288	Camshaft position sensor
26	6L266	Timing chain tensioner

27	6316	Crankshaft damper
28	6L253	Timing chain tensioner arm
29	6268	Timing chain
30	6M289	Timing chain guide
31	6M256	Timing chain tensioner
32	6L253	Timing chain tensioner arm
33	19D629	A/C compressor
34	6621	Oil pump
35	N806201	Crankshaft keyway

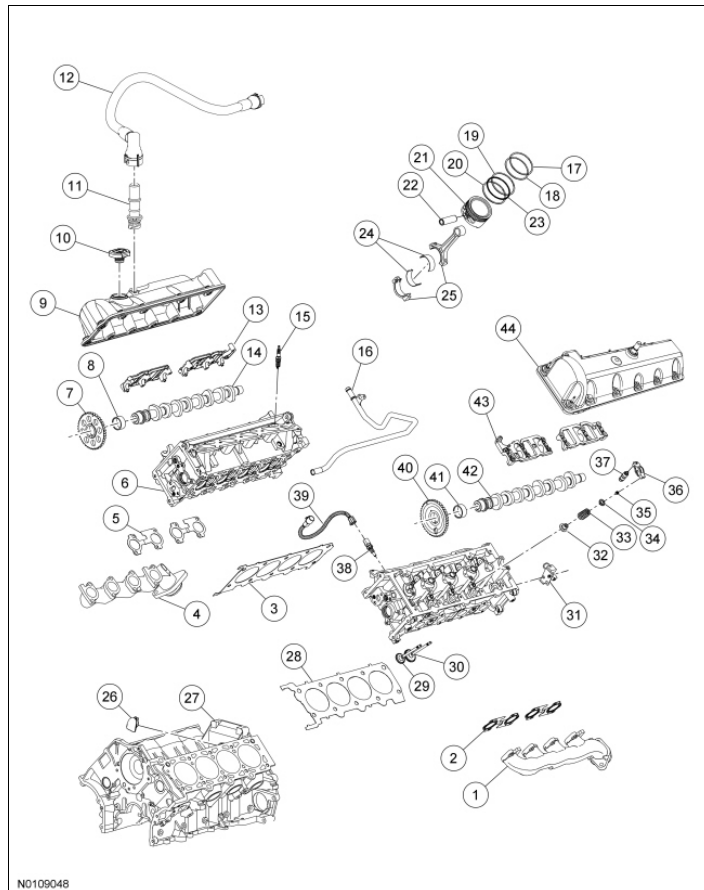
### Engine - Flex Plate and Engine Lubrication



Item	Part Number	Description
1	6K318	Crankshaft rear oil seal retainer
2	6701	Crankshaft rear oil seal
3	6310	Crankshaft oil slinger
4	6375	Flywheel
5	18801	Radio ignition interference capacitor
6	18B402	Coolant bypass tube
7	6750	Oil level indicator
8	6754	Oil level indicator tube
9	6714	Oil filter



10	9278	Engine Oil Pressure (EOP) switch
11	6881	Oil filter adapter
12	6A636	Oil filter adapter gasket
13	6881	Oil filter adapter
14	6A642	Engine oil cooler

**Engine - Upper End**

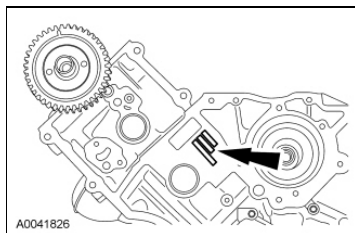
Item	Part Number	Description
1	9431	Exhaust manifold
2	9Y431	Exhaust manifold gasket (2 required)
3	6051	Head gasket
4	9430	Exhaust manifold
5	9Y431	Exhaust manifold gasket (2 required)
6	6049	Cylinder head
7	6256	Camshaft sprocket
8	6265	Camshaft sprocket spacer
9	6582	Valve cover
10	6766	Oil filler cap
11	6A666	PCV valve
12	6K817	Crankcase vent connector and hose
13	6B280	Camshaft bearing cap

14	6250	Camshaft
15	12405	Spark plug (8 required)
16	18663	Heater coolant bypass tube
17	6150	Top compression ring (8 required)
18	6152	Lower compression ring (8 required)
19	6159	Top oil control ring (8 required)
20	6159	Lower oil control ring (8 required)
21	6110	Piston (8 required)
22	6135	Piston pin (8 required)
23	6161	Oil ring spacer (8 required)
24	6211	Connecting rod bearings (16 required)
25	6205	Connecting rod assembly (8 required)
26	6C070	Torque converter inspection hold cover
27	6010	Cylinder block
28	6083	Head gasket
29	6505	Exhaust valve (8 required)
30	6507	Intake valve (8 required)
31	18801	Radio capacitor
32	6A517	Valve stem seal (16 required)
33	6513	Valve spring (16 required)
34	6514	Valve spring retainer (16 required)
35	6518	Valve spring retainer key (32 required)
36	6529	Roller follower (16 required)
37	6C501	Hydraulic lash adjuster (16 required)
38	6G004	Cylinder Head Temperature (CHT) sensor
39	12A654	CHT sensor harness
40	6256	Camshaft sprocket
41	6265	Camshaft sprocket spacer
42	6A274	Camshaft
43	6B280	Camshaft bearing cap
44	6A505	Valve cover

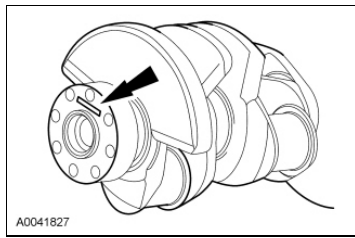
### Assembly

#### All engines

1. Record the main bearing code found on the front of the engine block.



2. Record the main bearing code found on the back of the crankshaft.



3. Using the data recorded earlier and the Bearing Select Fit Chart, Standard Bearings Chart determine the required bearing grade for each main bearing.
  - Read the first letter of the engine block main bearing code and the first letter of the crankshaft main bearing code.
  - Read down the column below the engine main bearing code letter, and across the row next to the crankshaft main bearing code letter, until the 2 intersect. This is the required bearing grade for the No. 1 crankshaft main bearing.
  - As an example, if the engine block code letter is "F" and the crankshaft code letter is "D," the correct bearing grade for this main bearing is "2."
  - Repeat this process for the remaining 4 main bearings.

		MINIMUM BLOCK DIA																													
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X						
		401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424						
MAXIMUM CRANKSHAFT DIA	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
	W	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	V	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	U	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	T	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	S	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	R	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	Q	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	P	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	O	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	M	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	K	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	J	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	I	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	H	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	G	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	F	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	E	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	D	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	C	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	B	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	A	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2

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4. If oversize bearings are being used, use the procedure in the previous step and the Bearing Select Fit Chart, Oversize Bearing Chart to determine the required grade for each main bearing.

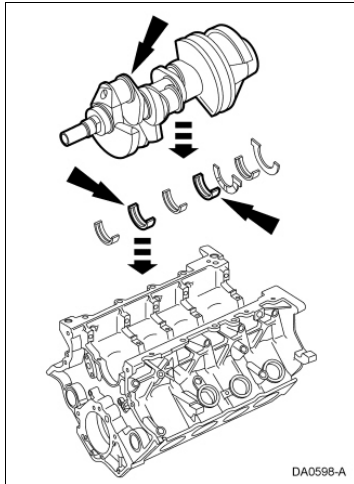
		MINIMUM BLOCK DIA																														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X							
		401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424							
MAXIMUM CRANKSHAFT DIA	X	67.254	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
	W	67.253	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	V	67.252	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	U	67.251	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	T	67.250	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	S	67.249	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	R	67.248	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	Q	67.247	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	P	67.246	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	O	67.245	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	N	67.244	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	M	67.243	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	L	67.242	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	K	67.241	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	J	67.240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	I	67.239	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	H	67.238	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	G	67.237	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	F	67.236	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	E	67.235	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	D	67.234	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	C	67.233	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	B	67.232	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
	A	67.231	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2

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5. **NOTE:** Before assembling the cylinder block, all sealing surfaces must be free of chips, dirt, paint and foreign material. Also, make sure the coolant and oil passages are clear.

Lubricate with clean engine oil and install the crankshaft upper main bearings into the cylinder block.

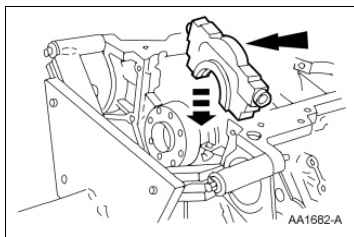
6. Install the crankshaft onto the upper crankshaft thrust bearing and main bearings.



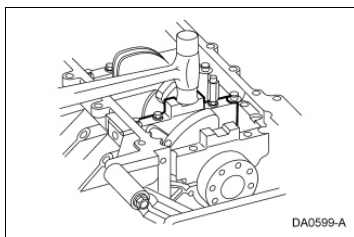
7. **NOTE:** To aid in assembly, apply petroleum jelly to the back of the crankshaft thrust washer.

**NOTE:** The oil groove on the thrust washer must face toward the rear of the engine (crankshaft surface).

Install the rear main bearing cap.



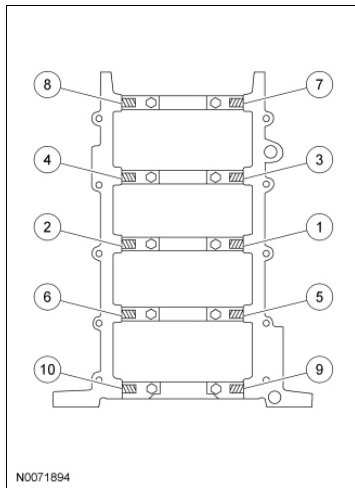
8. Install the crankshaft lower main bearings, thrust bearing and thrust washer into the main bearing caps. Locate the main bearing cap on the cylinder block and tap into place using a plastic or dead-blow hammer.



9. **NOTE:** The jackscrews are a part of the main bearing cap assembly and are screwed into the main caps, not the cylinder block.

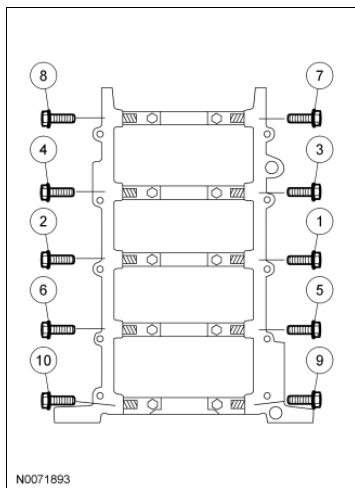
Back out the 10 jackscrews against the cylinder block in 2 stages, in the sequence shown.

- Stage 1: Tighten to 5 Nm (44 lb-in).
- Stage 2: Tighten to 10 Nm (89 lb-in).



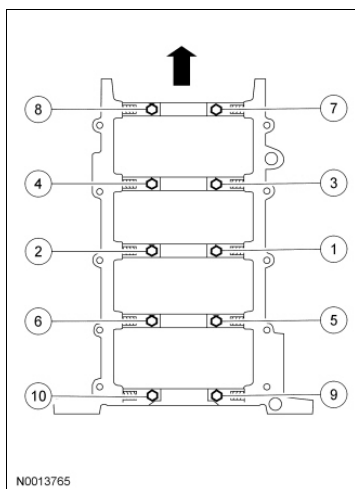
10. Install the 10 main bearing cap bolts and tighten in 2 stages, in the sequence shown.

- Stage 1: Tighten to 10 Nm (89 lb-in).
- Stage 2: Tighten to 21 Nm (15 lb-ft).



11. Tighten the 10 main bearing cap bolts in 2 stages, in the sequence shown.

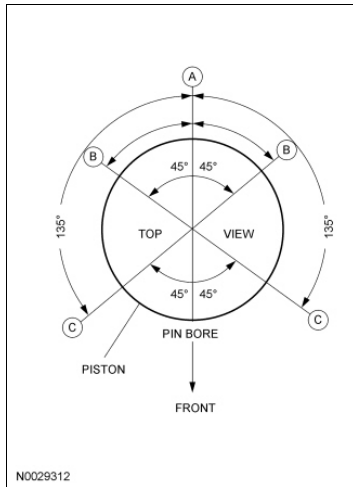
- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



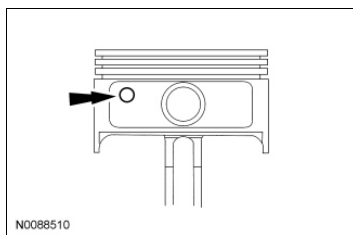
12. Check piston-to-cylinder block and ring clearances. For additional information, refer to [Section 303-00](#).

13. Assemble the 8 pistons. For additional information, refer to Piston in this section.

14. Make sure the ring gaps (oil spacer-A, oil ring-B, compression ring-C) are correctly spaced around the circumference of the piston.



15. Make sure the dimple in the piston faces the front of the engine.



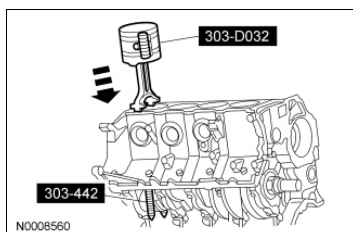
16. **NOTICE:** Do not scratch the cylinder walls or crankshaft journals with the connecting rod or engine failure may occur.

**NOTE:** Make sure the piston arrow is facing forward.

**NOTE:** The next 3 steps are for all 8 connecting rods, rod caps and pistons. Only one connecting rod, rod cap and piston is shown.

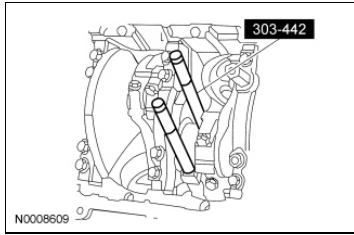
Use the Piston Ring Compressor and Connecting Rod Installer to install the piston and connecting rod assemblies.

- Lubricate the piston and ring with clean engine oil.
- Lubricate the rod bearings with clean engine oil.
- Rotate the crankshaft as necessary.



17. **NOTICE:** Do not scratch the cylinder walls or crankshaft journals with the connecting rod.

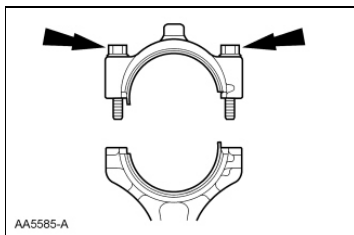
Once the connecting rod is seated on the crankshaft journal, remove the Connecting Rod Installer.



18. **NOTICE:** The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

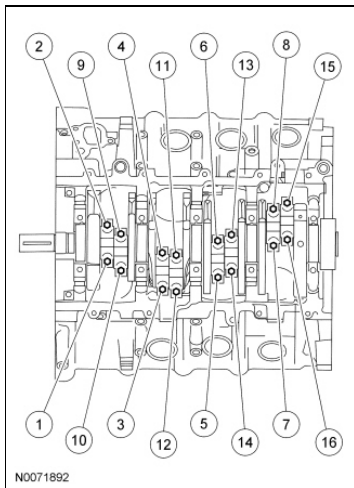
**NOTE:** The connecting rod caps have a cracked design and must make mate with the connecting rod ends. Excessive bearing clearance will result if not mated correctly.

Position the lower bearing and connecting rod bearing cap, and install the 2 new bolts loosely.



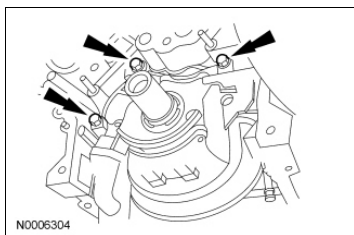
19. Tighten the 16 connecting rod bearing cap bolts in 3 stages, in the sequence shown.

- Stage 1: Tighten to 23 Nm (17 lb-ft).
- Stage 2: Tighten to 43 Nm (32 lb-ft).
- Stage 3: Rotate an additional 90-120 degrees.



20. Position the oil pump and install the 3 bolts.

- Tighten to 10 Nm (89 lb-in).



**Both cylinder heads**

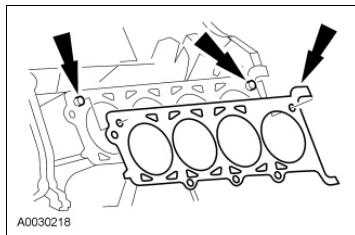
21. **NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to Cylinder Head in this section.

**NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.

**NOTE:** The new gasket has a film coating which is crucial to the gasket's ability to seat correctly. Do not scratch the gasket.

**NOTE:** RH head gasket shown, LH head gasket similar.

Install the head gaskets over the dowel pins.



22. **NOTE:** Cylinder head machining or milling is not authorized by the Ford Motor Company. Cylinder head flatness must be within 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area.

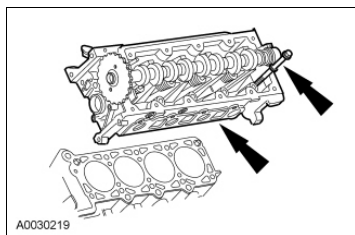
**NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to Cylinder Head in this section.

**NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.

**NOTE:** Do not allow the dowels to scratch the sealing of the cylinder head during cylinder head installation.

**NOTE:** RH cylinder head shown, LH cylinder head similar.

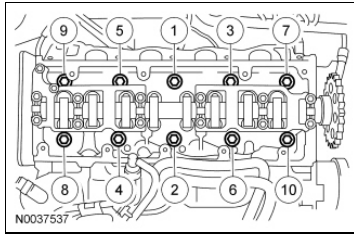
Install the cylinder head on the dowels and the head gasket. Loosely install new bolts.



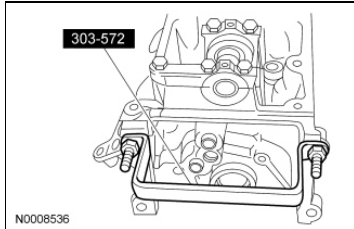
23. Tighten the 10 cylinder head bolts in 6 stages, in the sequence shown.

- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees (one-fourth turn).
- Stage 3: Loosen a minimum of one full turn (360 degrees).
- Stage 4: Tighten to 40 Nm (30 lb-ft).
- Stage 5: Tighten an additional 90 degrees (one-fourth turn).
- Stage 6: Tighten an additional 90 degrees (one-fourth turn).





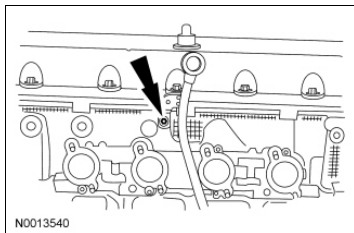
24. Remove the Cylinder Head Remover/Installer from both ends of the cylinder head.



25. **NOTE:** Lubricate the O-ring seal with clean engine oil.

Install a new O-ring seal on the oil level indicator tube and install the oil level indicator tube and bolt.

- Tighten to 10 Nm (89 lb-in).

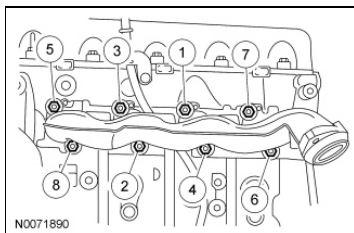


26. Install the new 8 LH exhaust manifold studs.

- Tighten to 12 Nm (106 lb-in).

27. Install a new LH exhaust manifold gasket the LH exhaust manifold and 8 new nuts.

- Tighten to 20 Nm (177 lb-in) in the sequence shown.

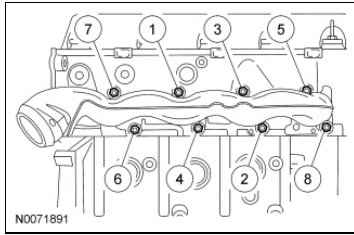


28. Install the new 8 RH exhaust manifold studs.

- Tighten to 12 Nm (106 lb-in).

29. Install a new RH exhaust manifold gasket the RH exhaust manifold and 8 new nuts.

- Tighten to 20 Nm (177 lb-in) in the sequence shown.



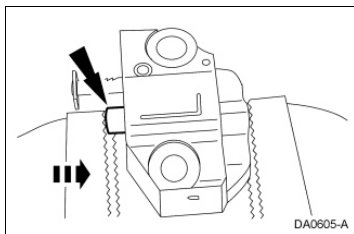
### Engines with ratcheting timing chain tensioners

30. **NOTICE:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

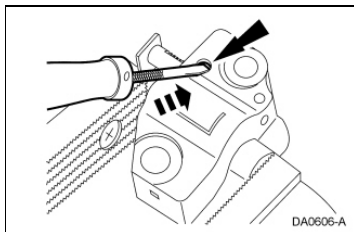
**NOTICE:** Do not compress the ratchet assembly. This will damage the ratchet assembly.

**NOTE:** LH shown, RH similar.

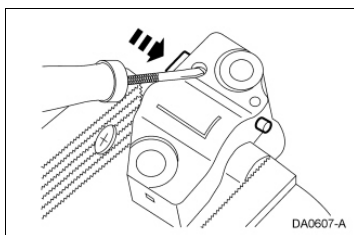
Compress each tensioner plunger, using an edge or a vise.



31. Using a small screwdriver or pick, push back and hold the ratchet mechanism.

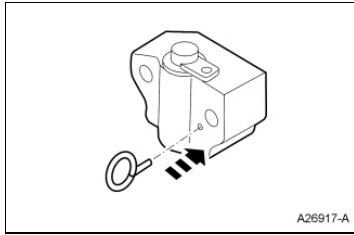


32. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.



33. Install a paper clip into the hole of each tensioner housing to hold the ratchet assembly and plunger in during installation.

- Remove the tensioner from the vise.



### Engines with non-ratcheting timing chain tensioners

34. **NOTICE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

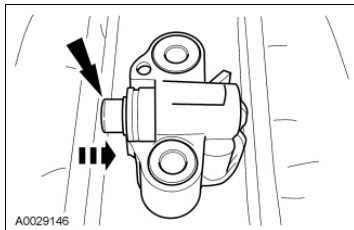
Inspect the RH and LH timing chain tensioners.

- Install new tensioners as necessary.

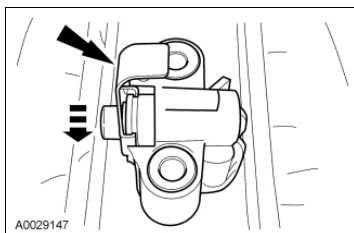
35. **NOTICE:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

**NOTE:** LH shown, RH similar.

Compress each tensioner plunger, using a vise.

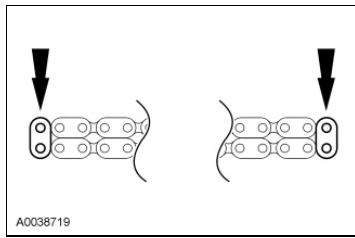


36. Install a Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.

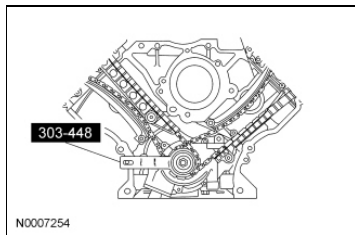


### All engines

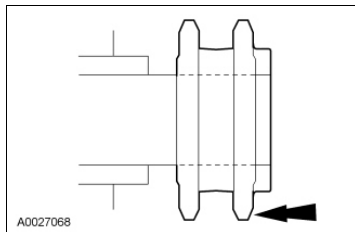
37. If the colored links are not visible, mark one link on one end and one link on the other end, and use as timing marks.



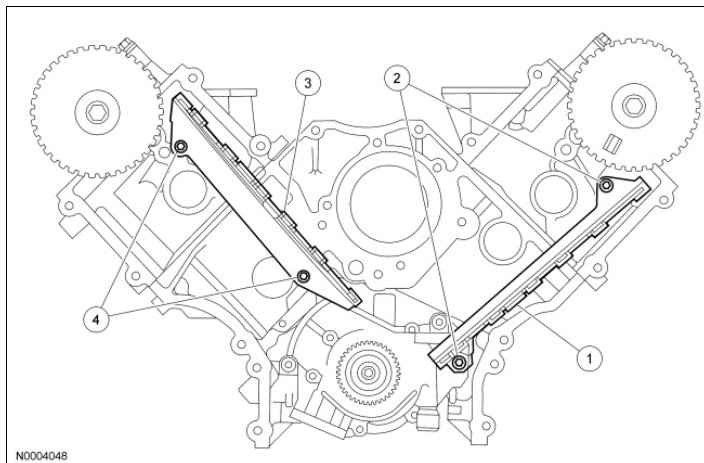
38. Using the Crankshaft Holding Tool, position the crankshaft.
- Remove the Crankshaft Holding Tool after crankshaft positioning.



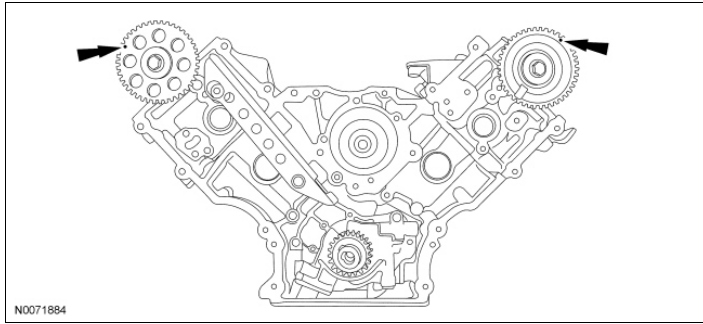
39. Install the crankshaft sprocket, making sure the flange faces forward.



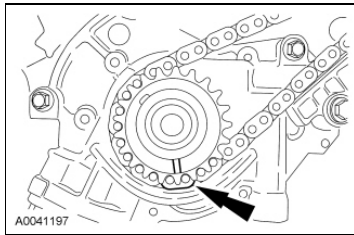
40. Install the timing chain guides.
1. Position the LH timing chain guide.
  2. Install and tighten the 2 LH bolts to 10 Nm (89 lb-in).
  3. Position the RH timing chain guide.
  4. Install and tighten the 2 RH bolts to 10 Nm (89 lb-in).



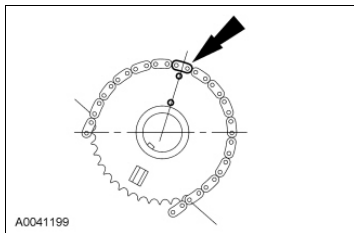
41. Rotate the RH camshaft sprocket until the timing mark is approximately at the 11 o'clock position.  
Rotate the LH camshaft sprocket until the timing mark is approximately at the 1 o'clock position.



42. Position the LH (inner) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



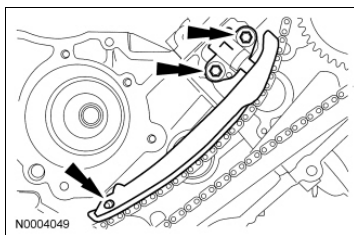
43. Install the LH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



44. **NOTE:** The LH timing chain tensioner arm has a bump near the dowel hole for identification.

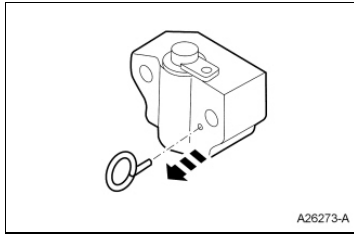
Position the LH timing chain tensioner on the dowel pin and install the LH timing chain tensioner and 2 bolts.

- Tighten to 25 Nm (18 lb-ft).



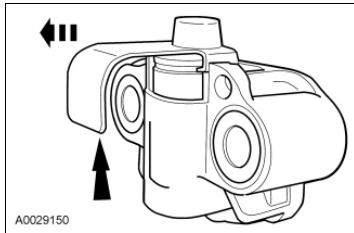
### Engines with ratcheting timing chain tensioners

45. Remove the paper clip from the LH timing chain tensioner.



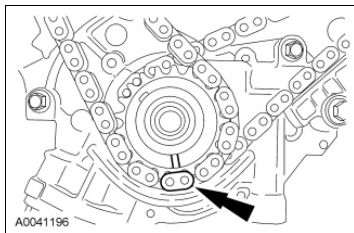
### Engines with non-ratcheting timing chain tensioners

46. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.

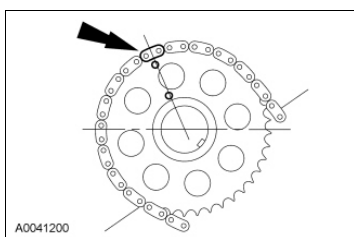


### All engines

47. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.

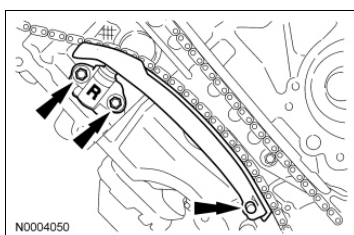


48. Install the RH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



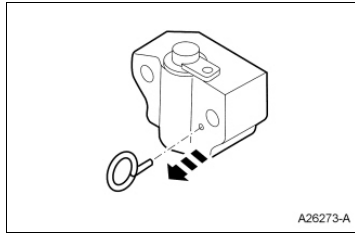
49. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner and 2 bolts.

- Tighten to 25 Nm (18 lb-ft).



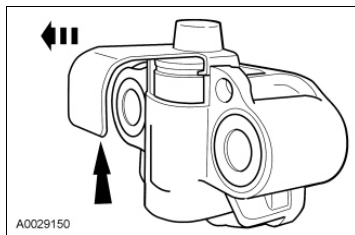
### Engines with ratcheting timing chain tensioners

50. Remove the paper clip from the RH timing chain tensioner.



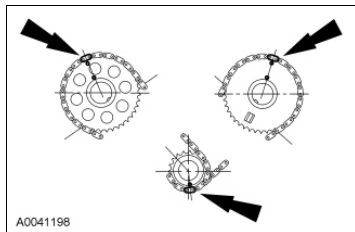
### Engines with non-ratcheting timing chain tensioners

51. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.

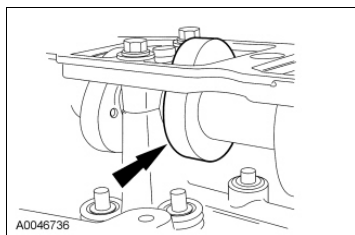


### All engines

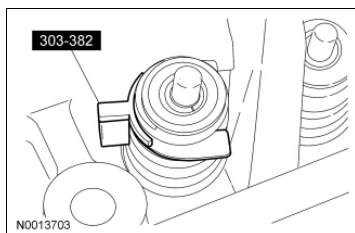
52. Make sure that the colored (marked) chain links are lined up with the dots on the crankshaft sprockets and the camshaft sprocket.



53. Rotate and camshaft until the lobe is in the upward position.

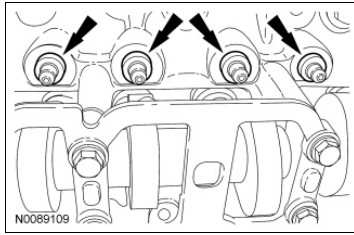


54. Install the Valve Spring Compressor Spacer between the valve spring coil to prevent valve stem seal damage.



55. **NOTE:** Lubricate the hydraulic lash adjusters with clean engine oil.

Install the 16 hydraulic lash adjusters in their original locations (4 shown).

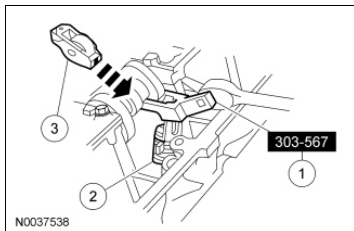


56. **NOTE:** Lubricate the camshaft roller followers using clean engine oil.

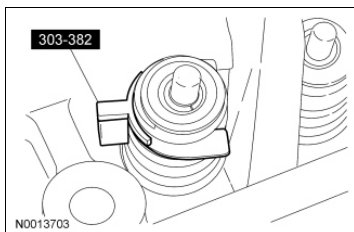
**NOTE:** Position the cam lobe away from the camshaft roller follower location prior to installing each camshaft roller follower.

Install the 16 camshaft roller followers.

1. Install the Valve Spring Compressor.
2. Compress the valve spring.
3. Install the 16 camshaft roller followers in their original locations.



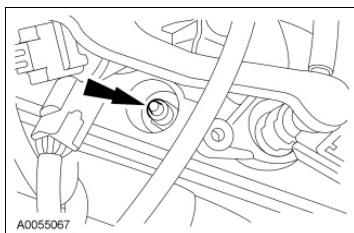
57. Remove the Valve Spring Compressor Spacer.



58. **NOTICE:** Only use hand tools when removing or installing the spark plugs or damage may occur to the cylinder head or spark plug.

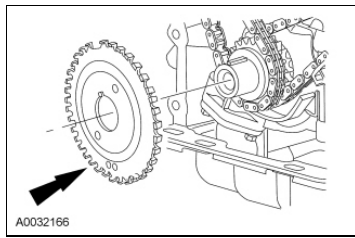
Install all 8 spark plugs.

- Tighten to 18 Nm (159 lb-in).



59. Install the crankshaft sensor ring.

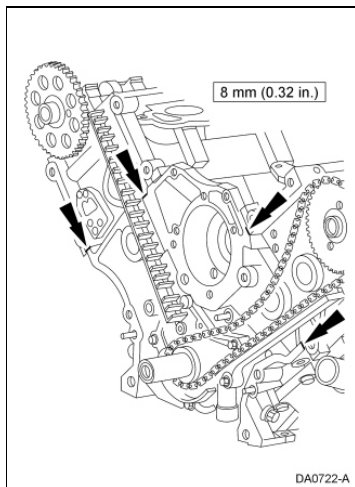




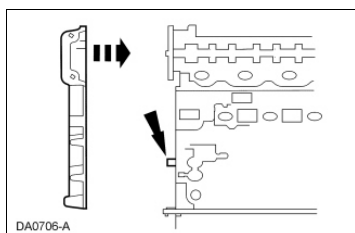
60. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

**NOTE:** RH timing chain removed for clarity.

Apply a bead of sealant along the head-to-block surface and the oil pan-to-block surface as specified.



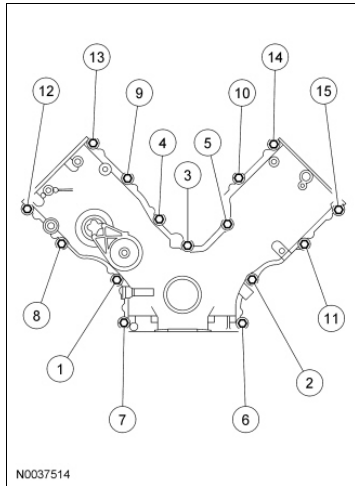
61. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.



62. Tighten the 15 front cover fasteners in the sequence shown to 25 Nm (18 lb-ft).

Item	Part Number	Description
1	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
2	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
3	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
4	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
5	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
6	W706508	Stud, hex-head pilot, M8 x 1.25 x 50 - M6 x 1 x 10
7	N808586	Stud, washer hex-head pilot, M8 x 1.25 - M6 x 1.0 x 86.35
8	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53

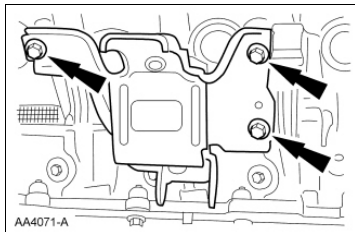
9	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
10	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
11	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
12	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
13	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
14	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
15	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1



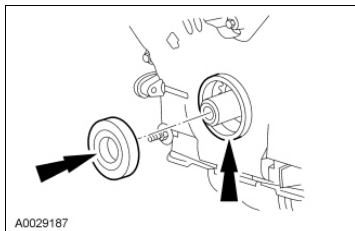
63. **NOTE:** RH shown, LH similar.

Install the RH and LH engine mounts and the 6 bolts.

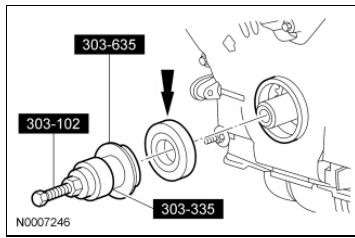
- Tighten to 70 Nm (52 lb-ft).



64. Lubricate the engine front cover and the front oil seal inner lip with clean engine oil.

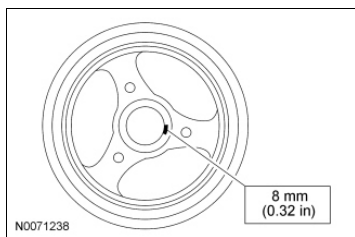


65. Using the Crankshaft Front Oil Seal Installer, Front Cover Oil Seal Installer and Crankshaft Vibration Damper Installer, install the front oil seal.

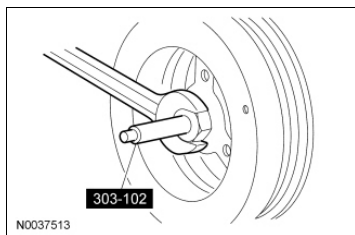


66. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply sealant to the Woodruff key slot on the crankshaft pulley.



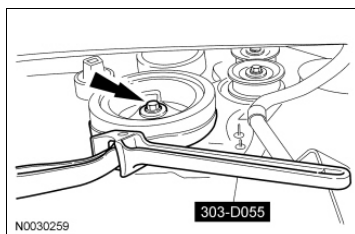
67. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.



68. **NOTE:** Use the Strap Wrench to hold the crankshaft pulley.

Install the bolt and washer and tighten the crankshaft pulley bolt in 4 stages.

- Stage 1: Tighten to 120 Nm (89 lb-ft).
- Stage 2: Loosen 360 degrees.
- Stage 3: Tighten to 50 Nm (37 lb-ft).
- Stage 4: Rotate an additional 90 degrees (one-fourth turn).

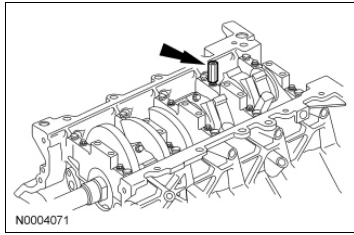


69. **NOTICE:** Make sure the O-ring seal is in place and not damaged. A missing or damaged O-ring seal may cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil.

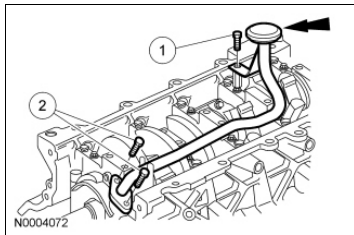
Install the oil pump screen and pickup tube spacer.

- Tighten to 25 Nm (18 lb-ft).



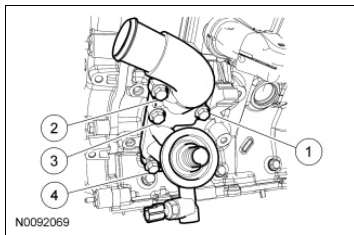
70. Position the oil pump screen and pickup tube, and install the 3 bolts.

1. Tighten to 25 Nm (18 lb-ft).
2. Tighten to 10 Nm (89 lb-in).



71. Install the new oil filter adapter gasket, oil filter adapter and the 4 bolts.

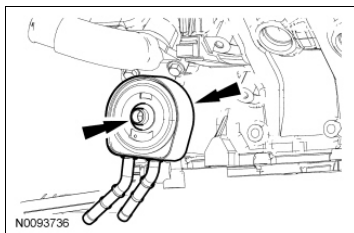
- Tighten to 25 Nm (18 lb-ft) in the sequence shown.



72. **NOTICE:** The oil cooler must be replaced or severe damage to the engine can occur.

If equipped, install the new oil cooler and install the oil cooler mounting bolt.

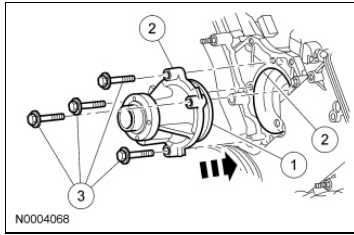
- Tighten to 46 Nm (34 lb-ft).



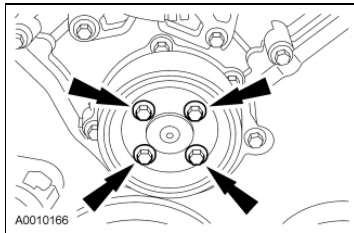
73. **NOTICE:** Do not rotate the coolant pump housing once the coolant pump has been positioned in the cylinder block. Damage to the O-ring seal will occur.

Install the coolant pump.

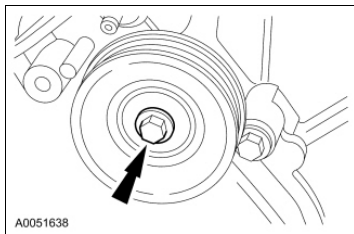
1. Lubricate the new O-ring seal using clean engine coolant.
2. Position the coolant pump into the engine block.
3. Install the 4 bolts and tighten to 25 Nm (18 lb-ft).



74. Position the coolant pump pulley on the coolant pump and install the 4 bolts.
- Tighten to 25 Nm (18 lb-ft).

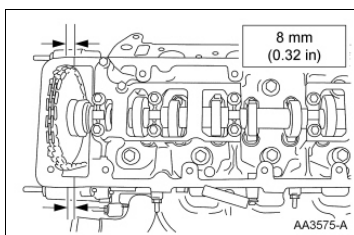


75. Position the accessory drive belt idler pulley and install the bolt.
- Tighten to 25 Nm (18 lb-ft).

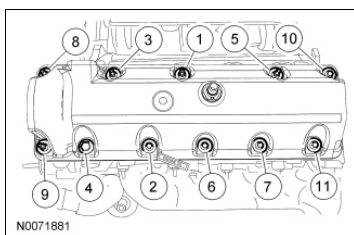


76. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply sealant in 2 places where the engine front cover meets the cylinder head.

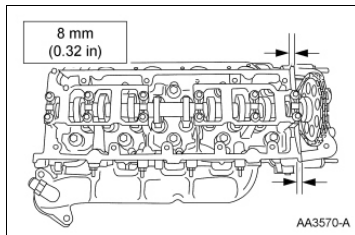


77. Install the new LH gasket into the valve cover and position on the cylinder head. Tighten the bolts in the sequence shown.
- Tighten to 10 Nm (89 lb-in).



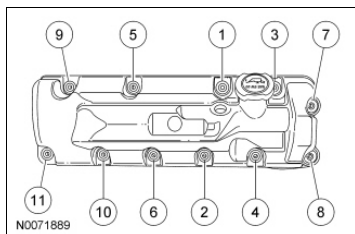
78. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply sealant in 2 places where the engine front cover meets the cylinder head.



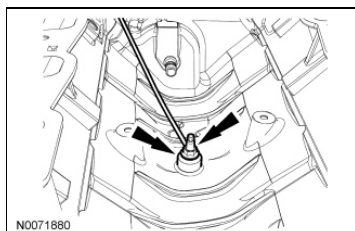
79. Install the new RH gasket into the valve cover and position on the cylinder head. Tighten the 11 bolts in the sequence shown.

- Tighten to 10 Nm (89 lb-in).



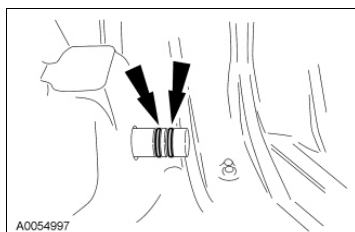
80. Install the Knock Sensor (KS) and the nut.

- Tighten to 20 Nm (177 lb-in).

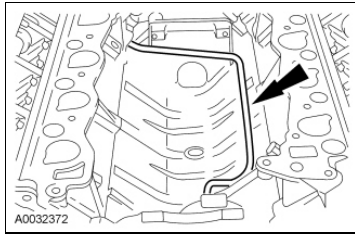


81. **NOTE:** Lubricate the O-ring seal with clean engine coolant.

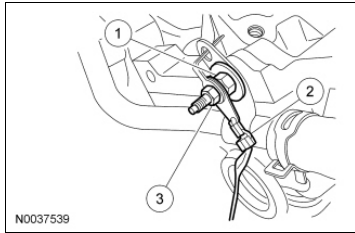
Inspect the O-rings seals. Install new seals, if necessary.



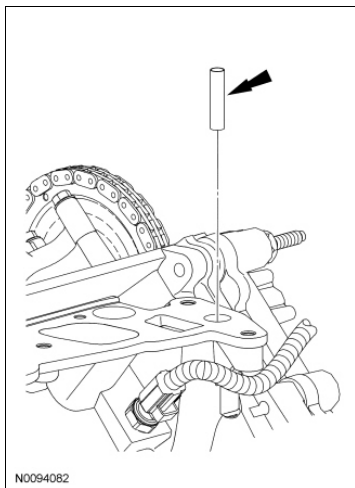
82. Install the coolant bypass tube.



83. Install the ground strap on the rear of the RH cylinder head.
1. Install the stud bolt and tighten to 25 Nm (18 lb-ft).
  2. Install the ground strap.
  3. Install the retaining nut and tighten to 10 Nm (89 lb-in).

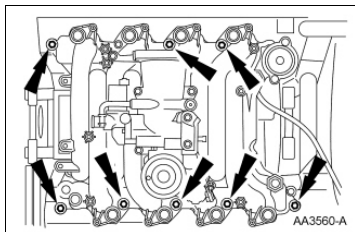


84. Install the insert into the LH cylinder head.

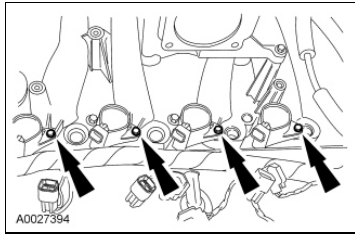


85. **NOTE:** Align the gasket locator tabs to slots in cylinder head.

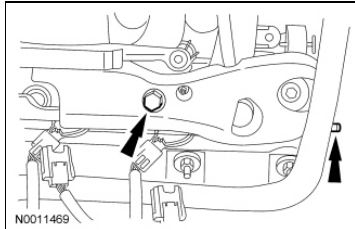
Install the new intake manifold gaskets, intake manifold and hand-tighten the 8 bolts at the locations shown.



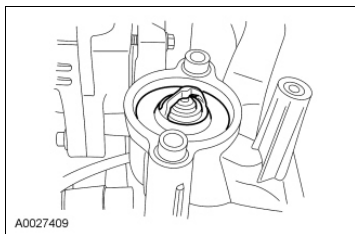
86. Install the 8 ignition coils and tighten the 8 bolts (4 shown).
- Tighten to 6 Nm (53 lb-in).



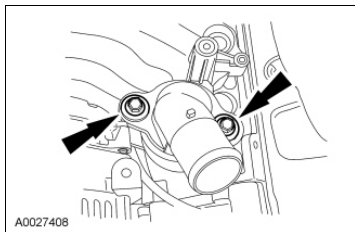
87. Install the intake manifold crash bracket bolt and loosely install the bolt and the stud bolt.



88. Install the thermostat.

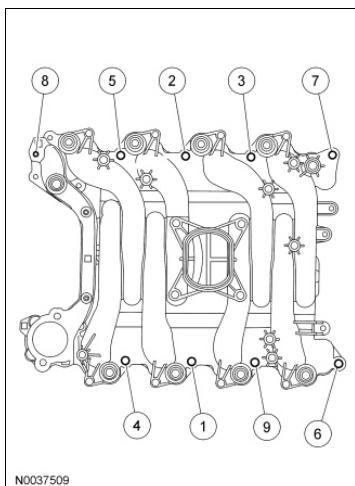


89. Install the coolant outlet adapter and loosely install the 2 bolts.



90. Tighten the 9 bolts in the sequence shown.

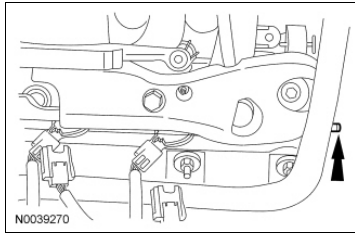
- Tighten to 25 Nm (18 lb-ft).



91. Tighten the stud bolt.

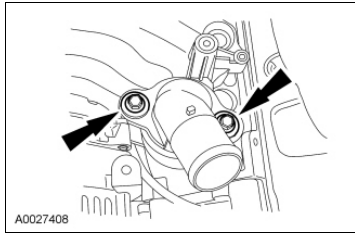


- Tighten to 25 Nm (18 lb-ft).

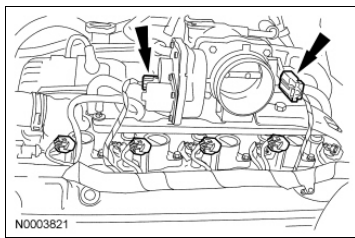


92. Tighten the 2 coolant outlet adapter bolts.

- Tighten to 25 Nm (18 lb-ft).

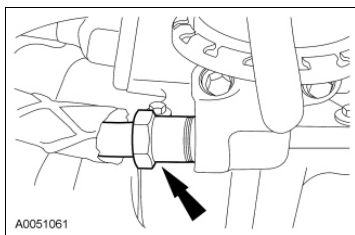


93. Connect the throttle control and throttle positioning sensor electrical connector.



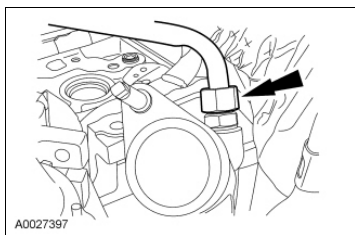
94. Connect the EGR tube to the EGR valve.

- Tighten to 43 Nm (32 lb-ft).



95. Connect the EGR tube to the exhaust manifold.

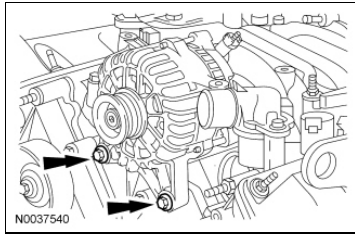
- Tighten to 43 Nm (32 lb-ft).



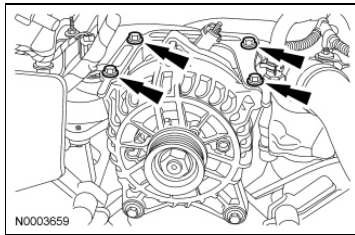
96. Position the fuel charging wiring at 2 locations at the back of the intake manifold.

97. Install the generator and the 2 bolts.

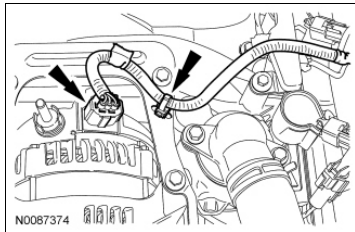
- Tighten to 25 Nm (18 lb-ft).



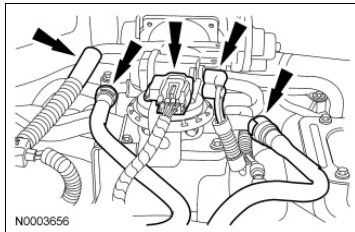
98. Install the generator mounting bracket and the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



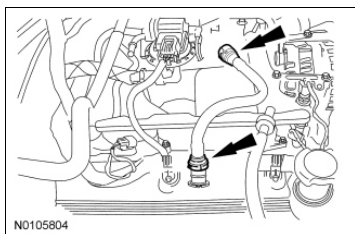
99. Attach the wire harness retainer and connect the generator electrical connector.



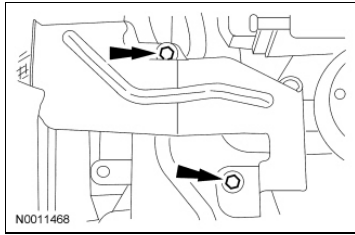
100. Position the vacuum harness and connect the vacuum hoses for the Evaporative Emission (EVAP) canister purge valve, the main chassis hose and the EGR valve.



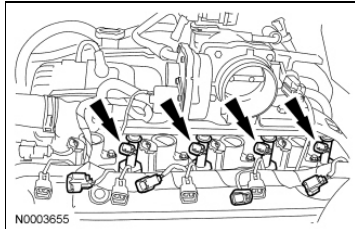
101. Connect the crankcase ventilation tube.



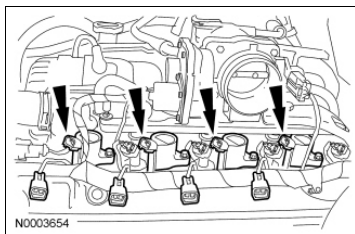
102. Install the intake manifold shield and 2 bolts.
- Tighten to 10 Nm (89 lb-in).



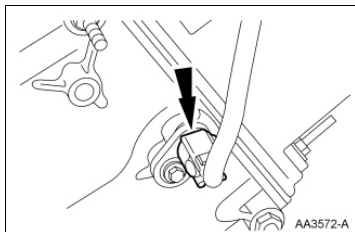
103. Connect the 8 fuel injector electrical connectors (4 shown).



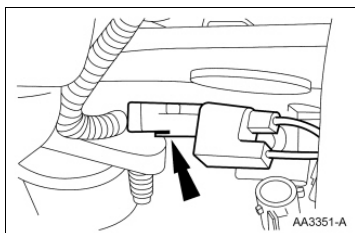
104. Connect the 8 ignition coil electrical connectors (4 shown).



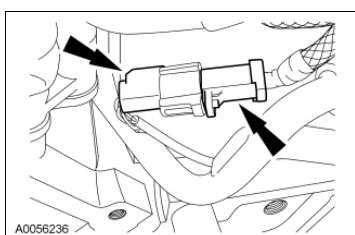
105. Connect the Camshaft Position (CMP) sensor electrical connector.



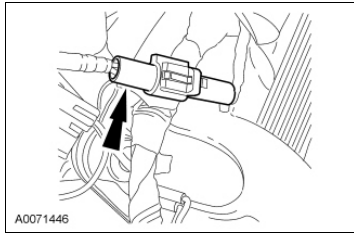
106. Connect the radio interference capacitor electrical connector.



107. Connect the KS electrical connector and install the harness retainer to the intake manifold.

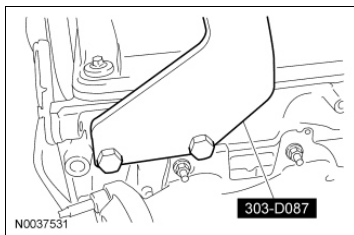


108. Connect the Cylinder Head Temperature (CHT) sensor electrical connector.

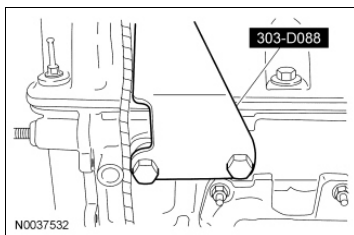


109. Install the battery cables and the bolt.

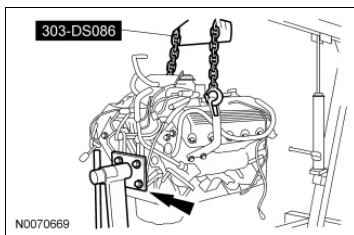
110. Install the Engine Lifting Bracket to the RH cylinder head.



111. Install the Engine Lifting Bracket to the LH cylinder head.

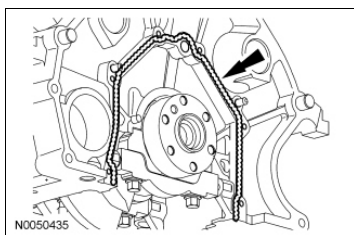


112. Using the Engine Lifting Bracket Set, remove the engine from the engine stand.

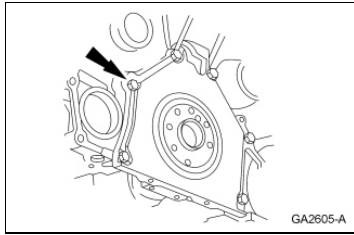


113. **NOTE:** The rear crankshaft seal retainer plate does not have a sealant groove. Gasket maker must be applied to the rear crankshaft seal retainer mating surface on the engine block.

Apply a bead of gasket maker to the crankshaft rear seal retainer plate mating surface on the engine block.

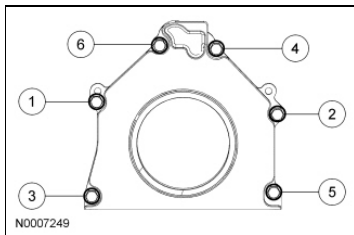


114. Install the crankshaft rear seal retainer plate and loosely install the 6 bolts.



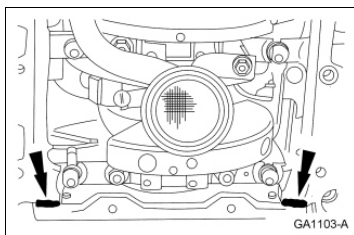
115. Tighten the 6 crankshaft rear seal retainer plate bolts in the sequence shown.

- Tighten to 10 Nm (89 lb-in).

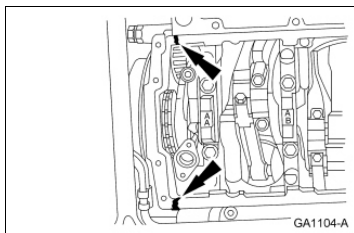


116. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

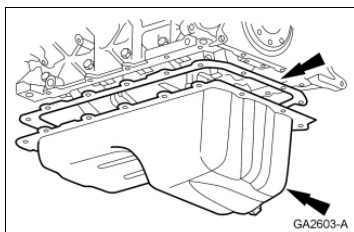
Apply the sealant at the rear oil seal retainer to cylinder block sealing surface.



117. Apply sealant at the front cover-to-cylinder block sealing surface.

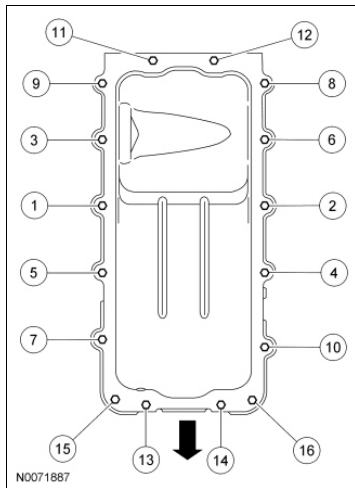


118. Position the new oil pan gasket, the oil pan and the loosely install the 16 bolts.

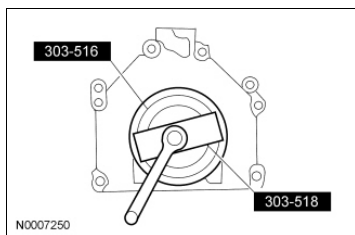


119. Tighten the 16 bolts in 2 stages, in the sequence shown.

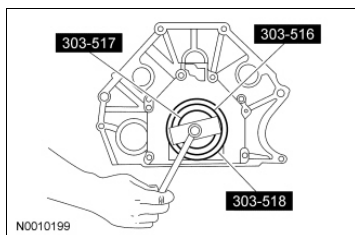
- Stage 1: Tighten to 20 Nm (177 lb-in).
- Stage 2: Rotate an additional 60 degrees.



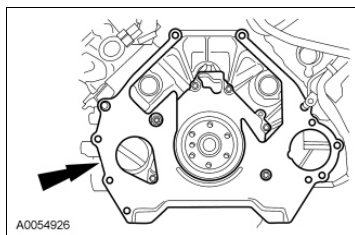
120. Using the Crankshaft Rear Oil Seal Installers, install the crankshaft rear oil seal.



121. Using the Crankshaft Rear Oil Seal Installer and Crankshaft Rear Oil Slinger Installer, install the crankshaft oil slinger.

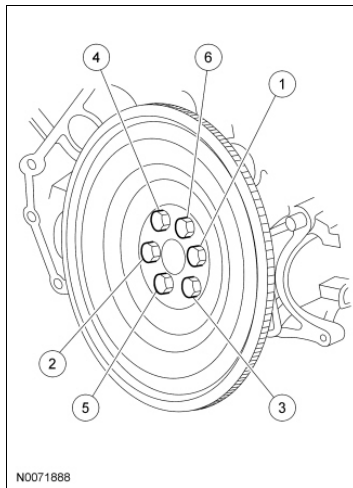


122. Install the engine/transmission spacer plate.












123. Position the flexplate and install the 6 bolts in the sequence shown.

- Tighten to 80 Nm (59 lb-ft).



**Cylinder Head**

## Special Tool(s)

 ST1331-A	Compressor Spacer, Valve Spring 303-382 (T91P-6565-AH)
 ST1330-A	Compressor, Valve Spring 303-567 (T97P-6565-AH)
 ST1335-A	Holding Tool, Crankshaft 303-448 (T93P-6303-A)
 ST2197-A	Installer, Crankshaft Front Oil Seal 303-635
 ST1287-A	Installer, Crankshaft Vibration Damper 303-102 (T74P-6316-B)
 ST1328-A	Installer, Front Cover Oil Seal 303-335 (T88T-6701-A)
 ST2443-A	Lifting Bracket Set, Engine 303-DS086 (D93P-6001-A)  Includes Lifting Bracket, Engine 303-D087 and 303-D088 or equivalent
 ST1668-A	Remover/Installer, Cylinder Head 303-572 (T97T-6000-A)
 ST1438-A	Strap Wrench 303-D055 (D85L-6000-A) or equivalent

## General Equipment

Hydraulic Chain Tensioner Retaining Clip - 1L3Z-6P250-AA
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## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor	WSS-M2C930-A



Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-

### Installation

#### Both cylinder heads

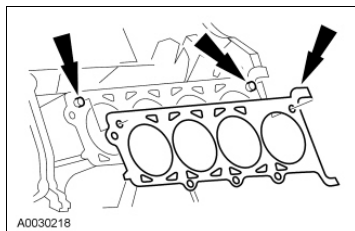
1. **NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to Cylinder Head in the Removal portion of this section

**NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.

**NOTE:** The new gasket has a film coating which is crucial to the gasket's ability to seal correctly. Do not scratch the gasket.

**NOTE:** RH head gasket shown, LH head gasket similar.

Install the new head gasket over the dowel pins.



2. **NOTE:** Cylinder head machining or milling is not authorized by the Ford Motor Company. Cylinder head flatness must be within 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area.

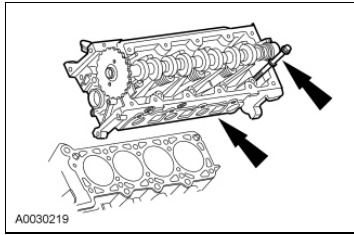
**NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to Cylinder Head in the Removal portion of this section.

**NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.

**NOTE:** Do not allow the dowels to scratch the sealing surface of the cylinder head during cylinder head installation.

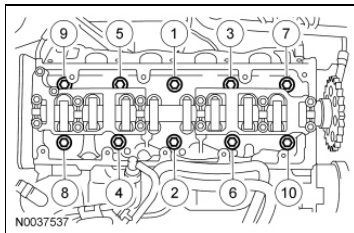
**NOTE:** RH cylinder head shown, LH cylinder head similar.

Install the cylinder head on the dowels and the head gasket. Loosely install new bolts.

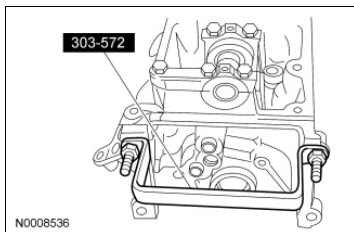


3. Tighten the cylinder head bolts in 6 stages, in the sequence shown.

- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees (one-fourth turn).
- Stage 3: Loosen a minimum of one full turn (360 degrees).
- Stage 4: Tighten to 40 Nm (30 lb-ft).
- Stage 5: Tighten an additional 90 degrees (one-fourth turn).
- Stage 6: Tighten an additional 90 degrees (one-fourth turn).



4. Remove the Cylinder Head Remover/Installer from both ends of the cylinder head.

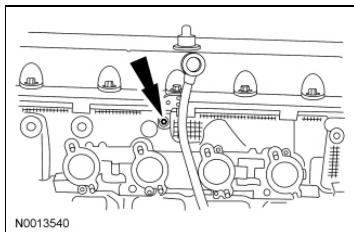


### LH cylinder head

5. **NOTE:** Lubricate the O-ring seal with clean engine oil.

Install a new O-ring seal on the oil level indicator tube and install the oil level indicator tube and bolt.

- Tighten to 10 Nm (89 lb-in).

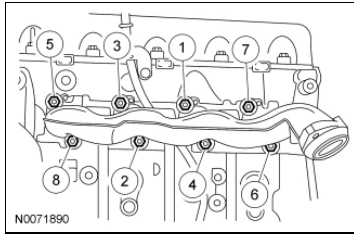


6. Install the 8 new LH exhaust manifold studs.

- Tighten to 12 Nm (106 lb-in).

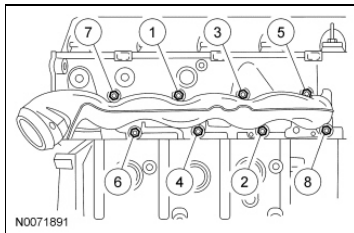
7. Install a new LH exhaust manifold gasket the LH exhaust manifold and 8 new nuts.

- Tighten to 20 Nm (177 lb-in) in the sequence shown.



## RH cylinder head

8. Install the 8 new RH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
9. Install a new RH exhaust manifold gasket the RH exhaust manifold and 8 new nuts.
  - Tighten to 20 Nm (177 lb-in) in the sequence shown.



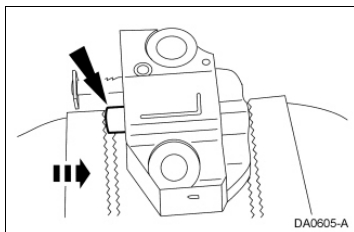
## Engines with ratcheting timing chain tensioners

10. **NOTICE:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

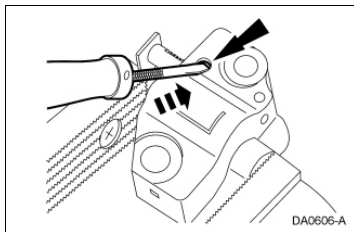
**NOTICE:** Do not compress the ratchet assembly. This will damage the ratchet assembly.

**NOTE:** LH shown, RH similar.

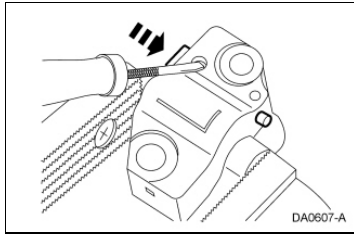
Compress each tensioner plunger, using an edge of a vise.



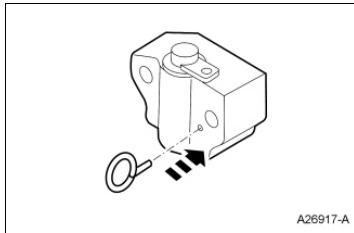
11. Using a small screwdriver or pick, push back and hold the ratchet mechanism.



12. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.



13. Install a paper clip into the hole of each tensioner housing to hold the ratchet assembly and plunger in during installation.
- Remove the tensioner from the vise.



#### Engines with non-ratcheting timing chain tensioners

14. **NOTICE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

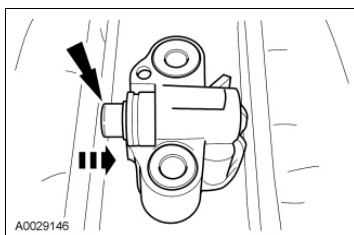
Inspect the RH and LH timing chain tensioners.

- Install new tensioners as necessary.

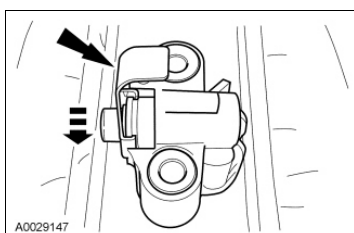
15. **NOTICE:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

**NOTE:** LH shown, RH similar.

Compress each tensioner plunger, using an edge of a vise.

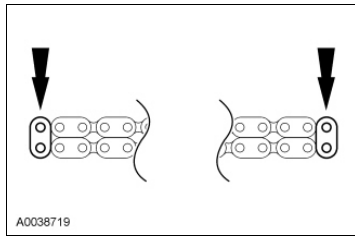


16. Install a Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.

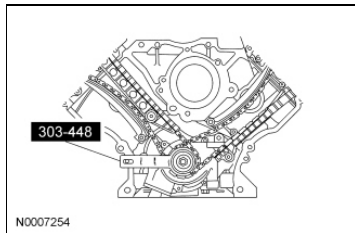


## Both cylinder heads

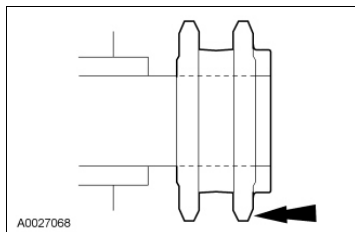
17. If the colored links are not visible, mark one link on one end and one link on the other end, and use as timing marks.



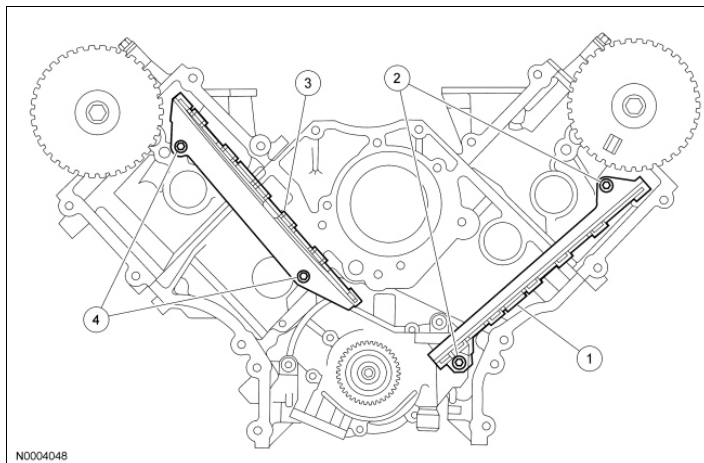
18. Using the Crankshaft Holding Tool, position the crankshaft.
- Remove the Crankshaft Holding Tool after crankshaft positioning.



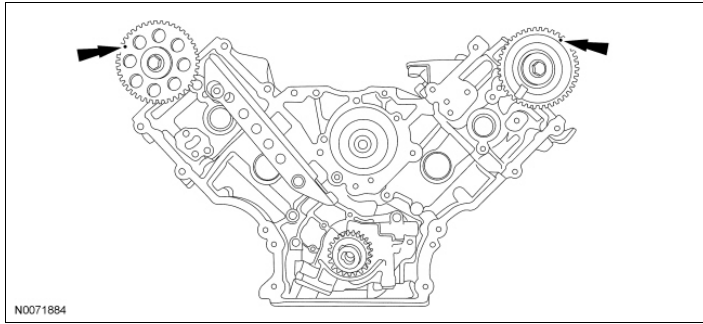
19. Install the crankshaft sprocket, making sure the flange faces forward.



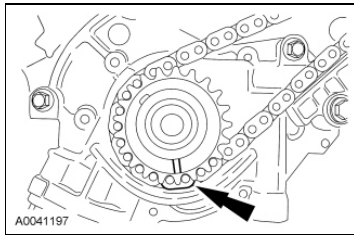
20. Install the timing chain guides.
1. Position the LH timing chain guide.
  2. Install and tighten the LH bolts to 10 Nm (89 lb-in).
  3. Position the RH timing chain guide.
  4. Install and tighten the RH bolts to 10 Nm (89 lb-in).



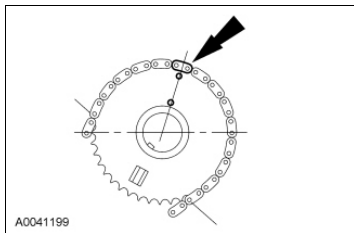
21. Rotate the RH camshaft sprocket until the timing mark is approximately at the 11 o'clock position.  
Rotate the LH camshaft sprocket until the timing mark is approximately at the 1 o'clock position.



22. Position the LH (inner) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



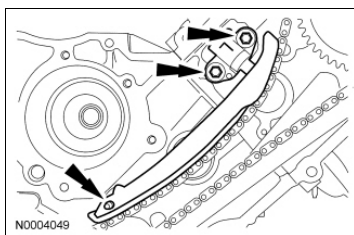
23. Install the LH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



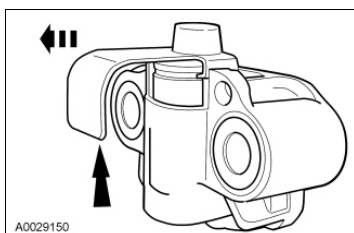
24. **NOTE:** The LH timing chain tensioner arm has a bump near the dowel hole for identification.

Position the LH timing chain tensioner on the dowel pin and install the LH timing chain tensioner.

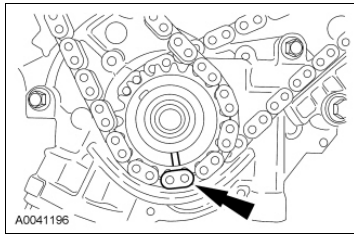
- Tighten to 25 Nm (18 lb-ft).



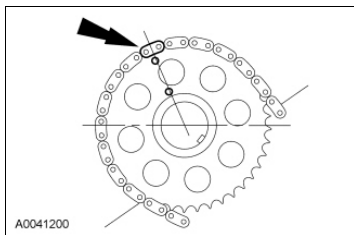
25. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.



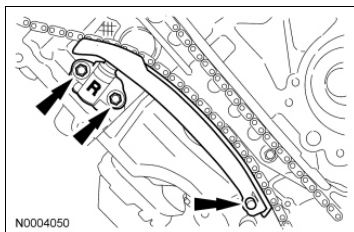
26. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



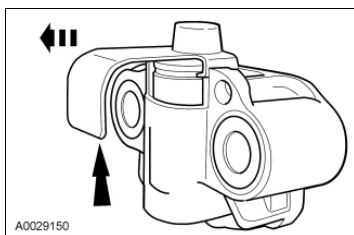
27. Install the RH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



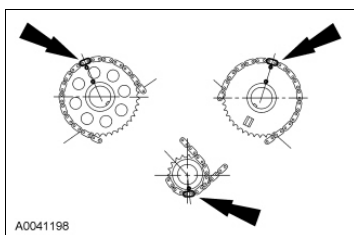
28. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner.
- Tighten to 25 Nm (18 lb-ft).



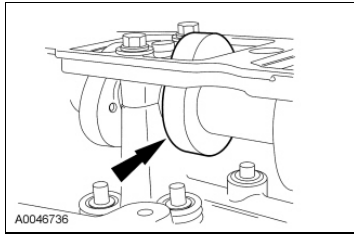
29. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.



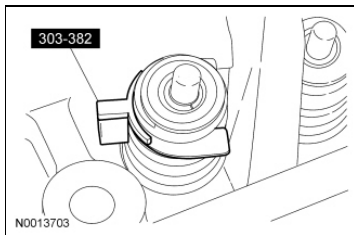
30. Make sure that the colored (marked) chain links are lined up with the dots on the crankshaft sprockets and the camshaft sprocket.



31. Rotate the camshaft until the lobe is in the upward position.

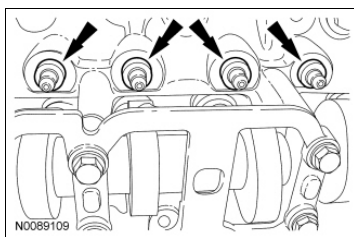


32. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



33. **NOTE:** Lubricate the hydraulic lash adjusters with clean engine oil.

Install the 16 hydraulic lash adjusters in their original locations (4 shown).

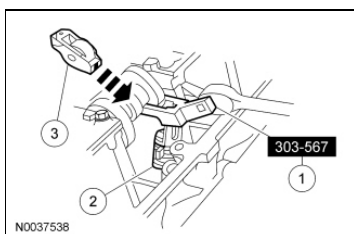


34. **NOTE:** Lubricate the camshaft roller followers using clean engine oil.

**NOTE:** Position the cam lobe away from the camshaft roller follower location prior to installing each camshaft roller follower.

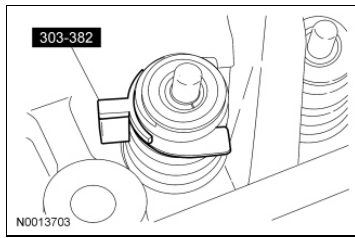
Install the camshaft roller follower.

1. Install the Valve Spring Compressor.
2. Compress the valve spring.
3. Install the camshaft roller followers in their original locations.



35. Remove the Valve Spring Compressor Spacer.

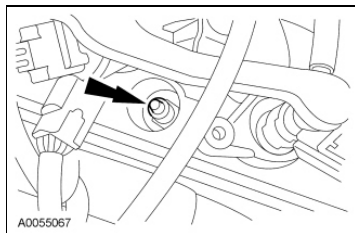




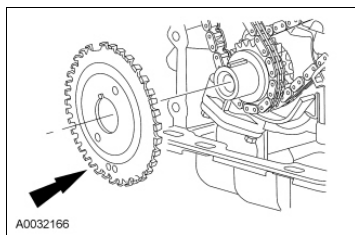
36. **NOTICE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.

Install all 8 spark plugs.

- Tighten to 18 Nm (159 lb-in).

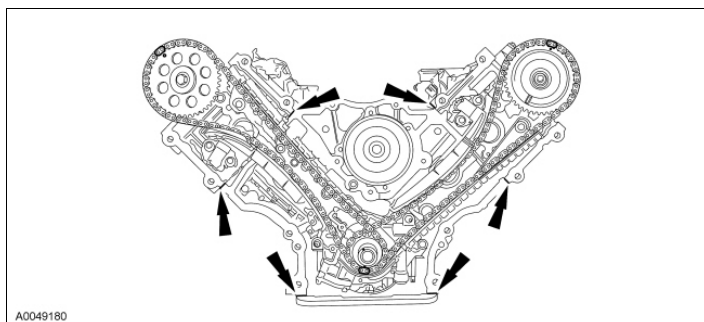


37. Install the crankshaft sensor ring.

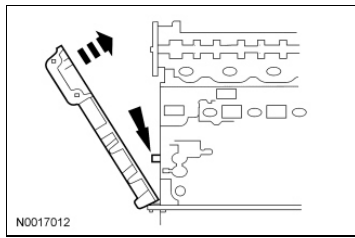


38. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply a bead of sealant along the head-to-block surface and the oil pan-to-block surface as specified.

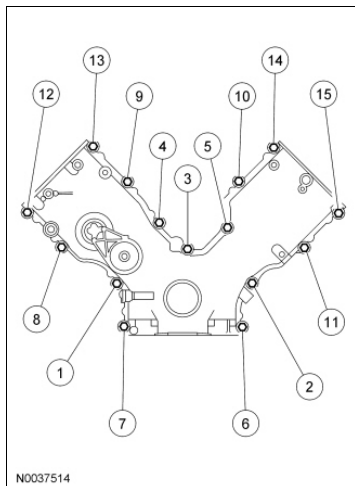


39. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.



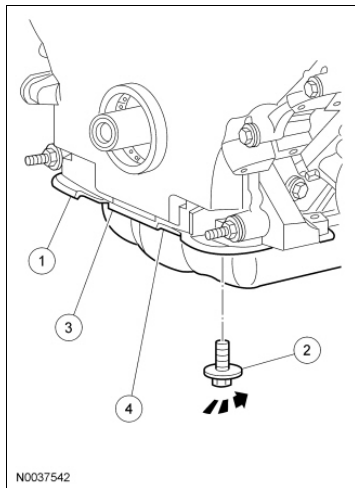
40. Tighten the front cover fasteners in the sequence shown to 25 Nm (18 lb-ft).

Item	Part Number	Description
1	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
2	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
3	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
4	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
5	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
6	W706508	Stud, hex-head pilot, M8 x 1.25 x 50 - M6 x 1 x 10
7	N808586	Stud, washer hex-head pilot, M8 x 1.25 - M6 x 1.0 x 86.35
8	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
9	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
10	N806177	Bolt, hex flange head pilot, M8 x 1.25 x 53
11	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
12	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
13	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
14	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1
15	N806300	Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1



41. Loosely install the 4 bolts, then tighten in 2 stages in the sequence shown.

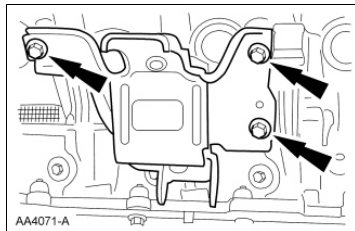
- Stage 1: Tighten to 20 Nm (177 lb-in).
- Stage 2: Tighten an additional 60 degrees.



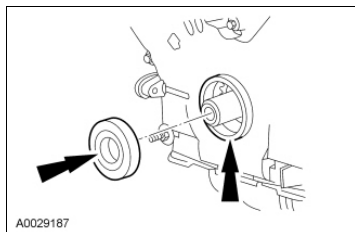
42. **NOTE:** RH shown, LH similar.

Install the RH and LH engine mounts and the bolts.

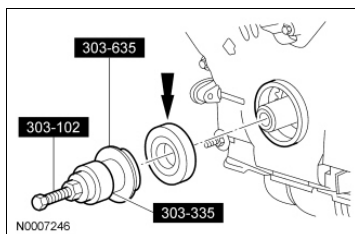
- Tighten to 70 Nm (52 lb-ft).



43. Lubricate the engine front cover and the front oil seal inner lip with clean engine oil.

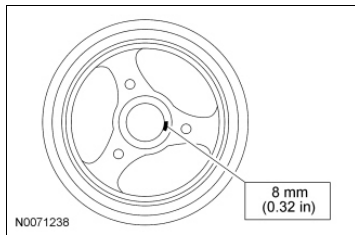


44. Using the Crankshaft Front Oil Seal Installer, Front Cover Oil Seal Installer and Crankshaft Vibration Damper Installer, install the front oil seal.

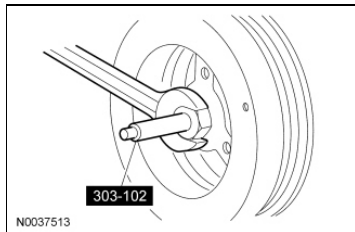


45. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply sealant to the Woodruff key slot on the crankshaft pulley.



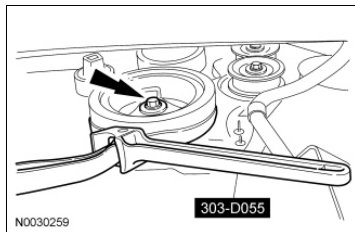
46. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.



47. **NOTE:** Use a Strap Wrench to hold the pulley.

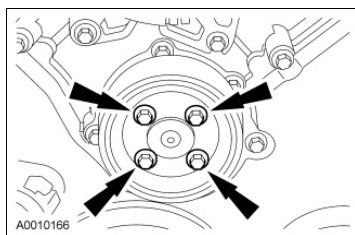
Tighten the crankshaft pulley bolt in 4 stages.

- Stage 1: Tighten to 120 Nm (89 lb-ft).
- Stage 2: Loosen 360 degrees.
- Stage 3: Tighten to 50 Nm (37 lb-ft).
- Stage 4: Rotate an additional 90 degrees (one-fourth turn).



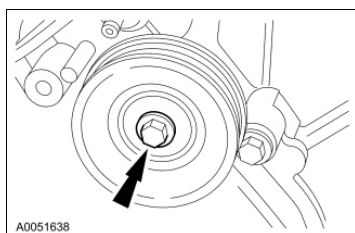
48. Position the coolant pump pulley on the coolant pump and install the bolts.

- Tighten to 25 Nm (18 lb-ft).



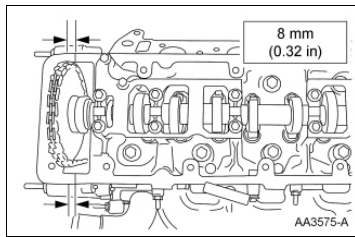
49. Install the accessory drive belt idler pulley and bolt.

- Tighten to 25 Nm (18 lb-ft).



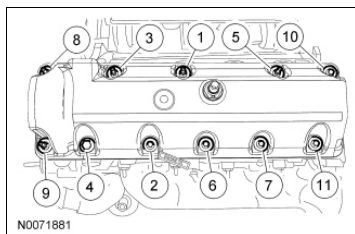
50. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply sealant in 2 places where the engine front cover meets the cylinder head.



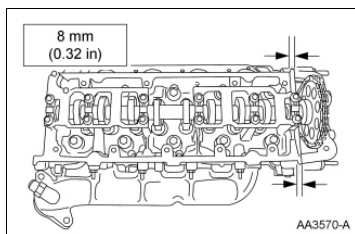
51. Install the new valve cover gasket into the valve cover and position on the cylinder head. Tighten the bolts in the sequence shown.

- Tighten to 10 Nm (89 lb-in).



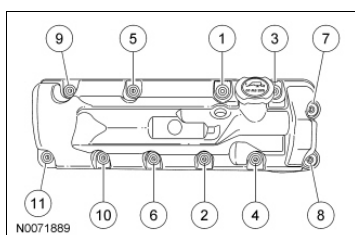
52. **NOTICE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

Apply sealant in 2 places where the engine front cover meets the cylinder head.

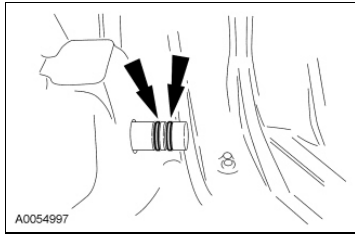


53. Install the gasket into the valve cover and position on the cylinder head. Tighten the bolts in the sequence shown.

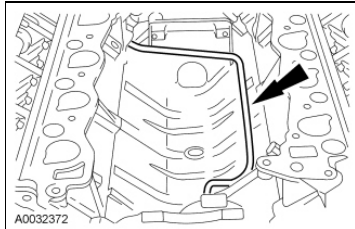
- Tighten to 10 Nm (89 lb-in).



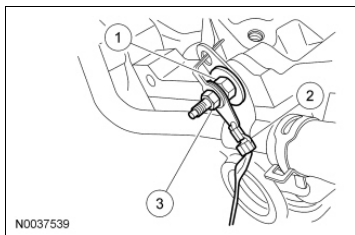
54. Inspect the O-ring seals. Install new seals if necessary.



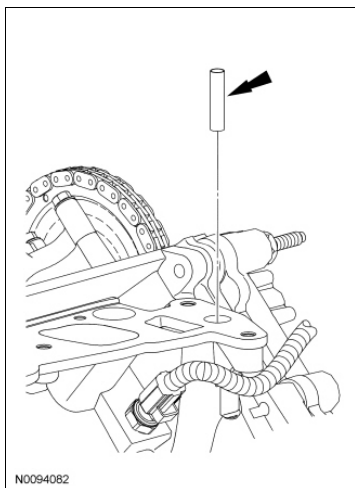
55. Install the coolant bypass tube.



56. Install the ground strap on the rear of the RH cylinder head.
1. Install the stud bolt and tighten to 25 Nm (18 lb-ft).
  2. Install the ground strap.
  3. Install the retaining nut and tighten to 10 Nm (89 lb-in).

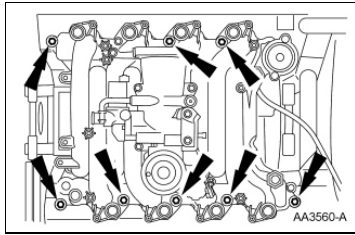


57. Install the insert into the LH cylinder head.

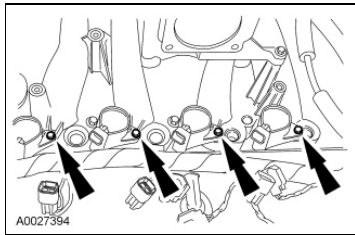


58. **NOTE:** Align the gasket locator tabs to slots in cylinder head.

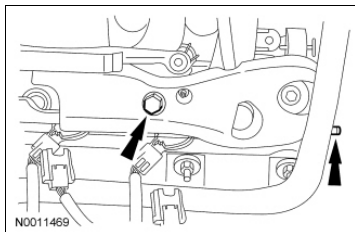
Install the new intake manifold gaskets, intake manifold and hand-tighten the bolts at the locations shown.



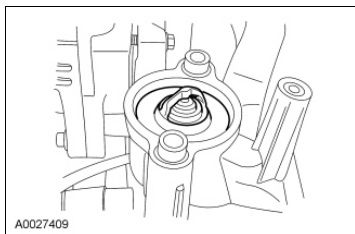
59. Install the 8 ignition coils and tighten the 8 bolts (4 shown).
- Tighten to 6 Nm (53 lb-in).



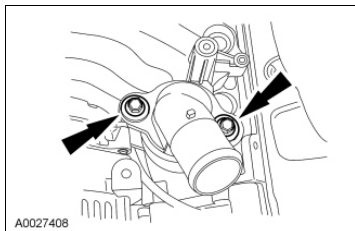
60. Install the intake manifold bracket and loosely install the bolt and the stud bolt.



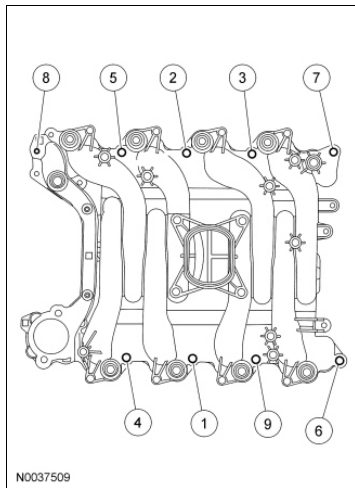
61. Install the thermostat.



62. Install the coolant outlet adapter and loosely install the 2 bolts.

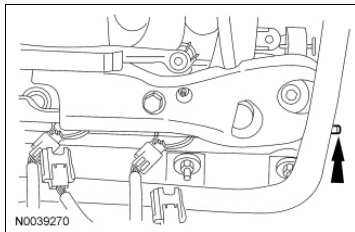


63. Tighten the bolts in the sequence shown.
- Tighten to 25 Nm (18 lb-ft).



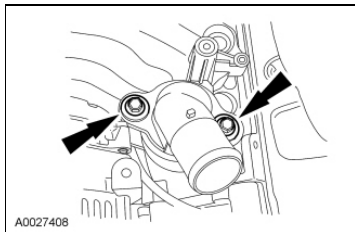
64. Tighten the stud bolt.

- Tighten to 25 Nm (18 lb-ft).



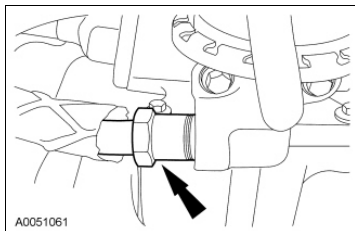
65. Tighten the bolts.

- Tighten to 25 Nm (18 lb-ft).



66. Connect the EGR tube to the EGR valve.

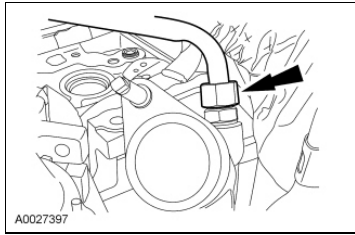
- Tighten to 43 Nm (32 lb-ft).



67. Connect the EGR tube-to-exhaust manifold connector.

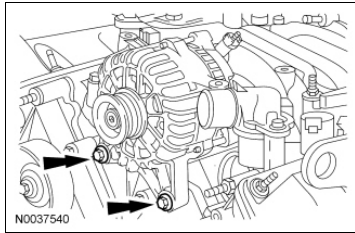
- Tighten to 43 Nm (32 lb-ft).



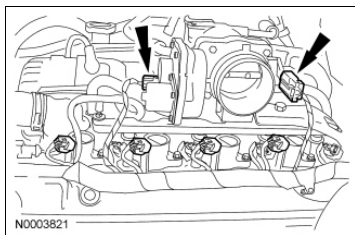


68. Position the fuel charging wiring at 2 locations at the back of the intake manifold.

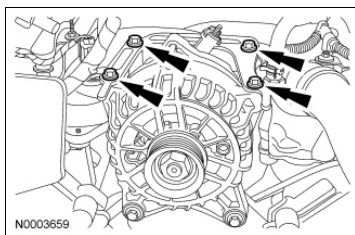
69. Install the generator and the 2 bolts.
- Tighten to 25 Nm (18 lb-ft).



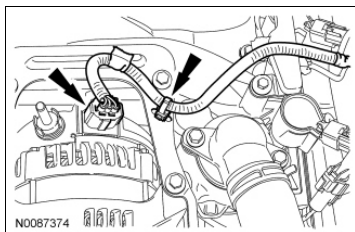
70. Connect the throttle control and the Throttle Position (TP) sensor electrical connector.



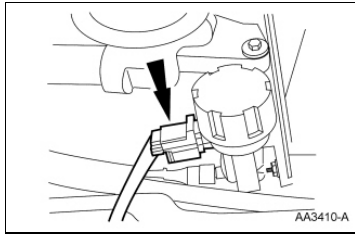
71. Install the generator mounting bracket and the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



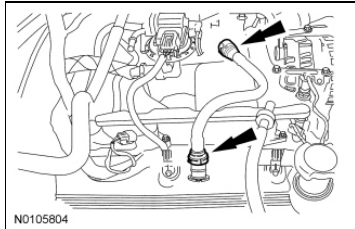
72. Attach the wire harness retainer and connect the generator electrical connector.



73. Connect the electrical connector to the EGR vacuum regulator solenoid.

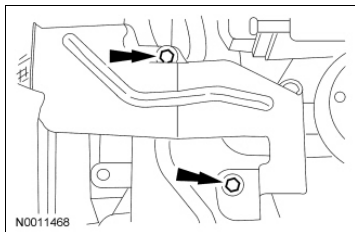


74. Connect the crankcase ventilation tube.

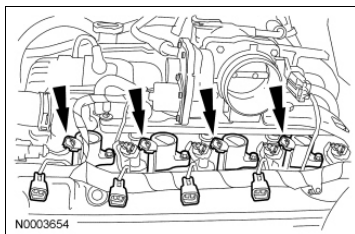


75. Install the intake manifold shield and the 2 bolts.

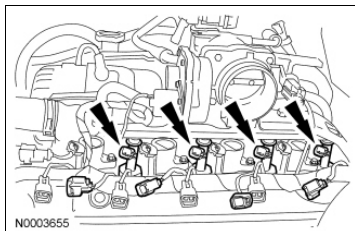
- Tighten to 10 Nm (89 lb-in).



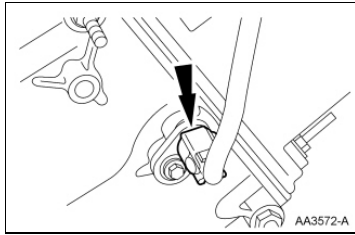
76. Connect the 8 fuel injector electrical connectors (4 shown).



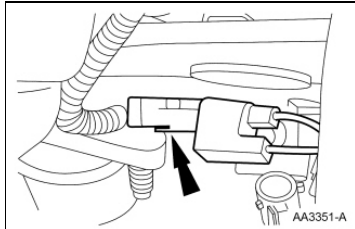
77. Connect the 8 ignition coil electrical connectors.



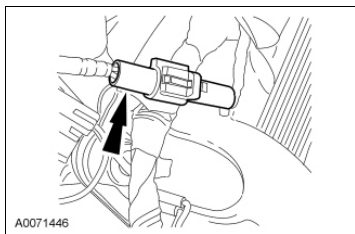
78. Connect the Camshaft Position (CMP) sensor electrical connector.



79. Connect the radio interference capacitor electrical connector.

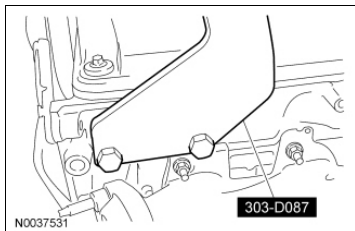


80. Connect the Cylinder Head Temperature (CHT) sensor electrical connector.

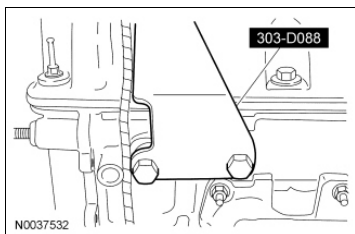


81. Install the battery cables and the bolt.

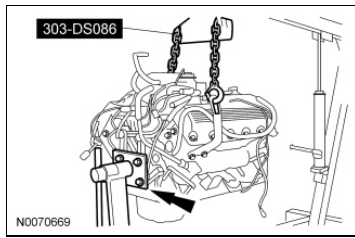
82. Install the Engine Lifting Bracket to the RH cylinder head.



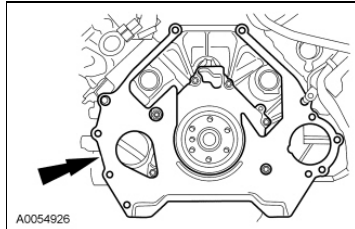
83. Install the Engine Lifting Bracket to the LH cylinder head.



84. Using the Engine Lifting Bracket Set, remove the engine from the engine stand.

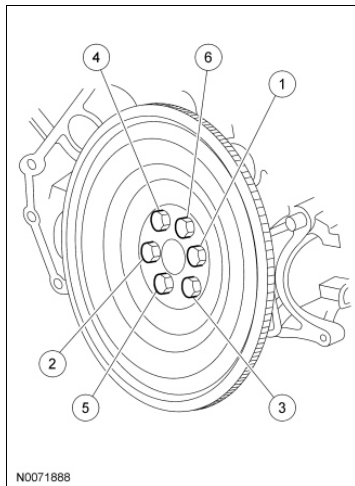


85. Install the engine/transmission spacer plate.



86. Position the flexplate and install the bolts in the sequence shown.

- Tighten to 80 Nm (59 lb-ft).



87. Install the engine. For additional information, refer to Engine in the Installation portion of this section.



88. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
**For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system



**Engine**

## Special Tool(s)

	Lifting Bracket Set, Engine 303-DS086 (D93P-6001-A) or equivalent
	Socket, Exhaust Gas Oxygen Sensor 303-476 (T94P-9472-A)

## Material

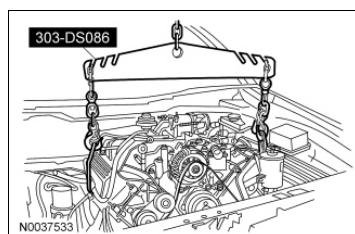
Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

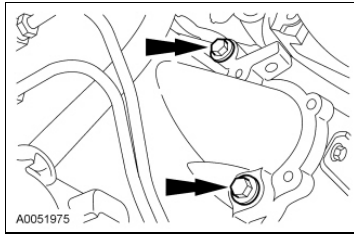
2. Using the Engine Lifting Bracket Set, install the engine assembly in the vehicle.



3. **NOTE:** When vehicle is raised, verify that the torque converter is correctly seated.

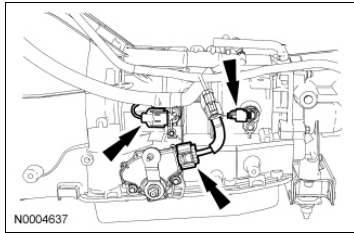
Install the 4 transmission bellhousing bolts (2 shown) and 1 stud.

- Tighten to 48 Nm (35 lb-ft).

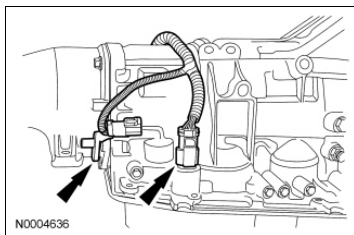


4. Attach the wiring harness to the retainers on the transmission.

5. Connect the Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor and the Turbine Shaft Speed (TSS) sensor electrical connectors.



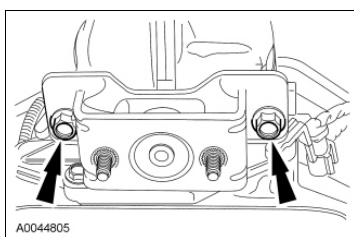
6. Connect the Heated Oxygen Sensor (HO2S) and the solenoid body sensor electrical sensors.



7. Raise the transmission and install the transmission insulator.

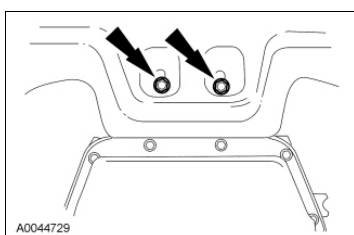
8. Install the 2 insulator bolts.

- Tighten to 90 Nm (66 lb-ft).



9. Lower the transmission and install the 2 transmission insulator nuts.

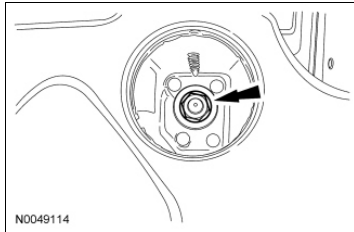
- Tighten to 30 Nm (22 lb-ft).



10. **NOTE:** LH shown, RH similar.

Install the 2 engine mount nuts.

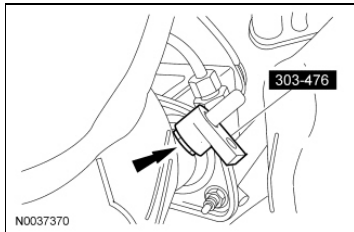
- Tighten to 90 Nm (66 lb-ft).



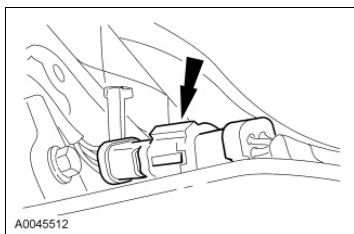
11. **NOTE:** Apply a light coat of anti-seize lubricant to the threads of the HO2S .

Using the Exhaust Gas Oxygen Sensor Socket, install the HO2S .

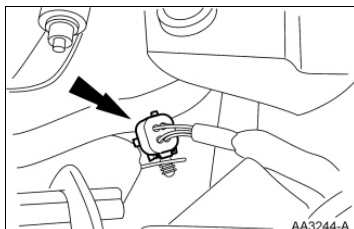
- Calculate the correct torque wrench setting for the following torque. For additional information, Refer to the Torque Wrench Adapter Formulas in the Appendix.
- Tighten to 40 Nm (30 lb-ft).



12. Connect the LH HO2S electrical connector.



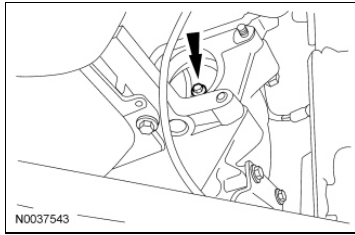
13. Connect the RH HO2S electrical connector.



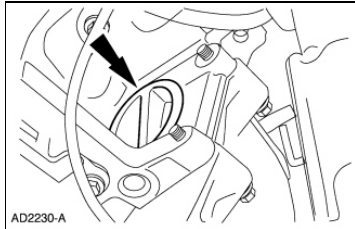
14. Install the 4 torque converter nuts.

- Rotate the crankshaft to access the nuts.
- Tighten to 36 Nm (27 lb-ft).



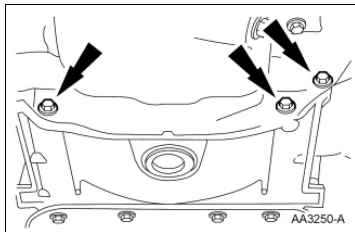


15. Install the rubber access plug.



16. Install the inspection cover and the 3 bolts.

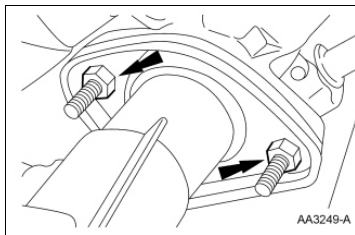
- Tighten to 19 Nm (168 lb-in).



17. Install the starter motor. For additional information, refer to [Section 303-06](#) .

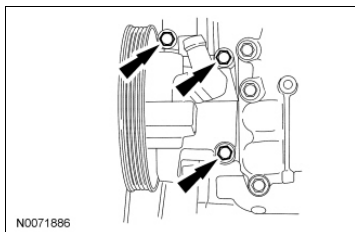
18. Position the exhaust, install the 4 new nuts and remove the support.

- Tighten to 48 Nm (35 lb-ft).



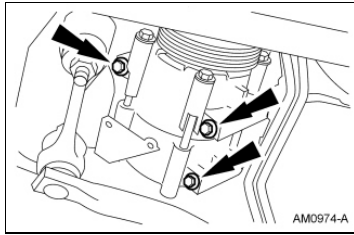
19. Install the power steering pump and the 3 bolts.

- Tighten to 25 Nm (18 lb-ft).

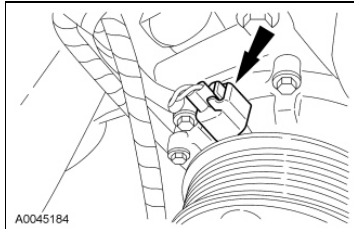


20. Install the A/C compressor and the 3 bolts.

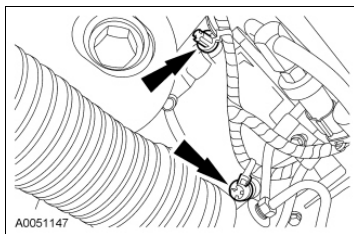
- Tighten to 25 Nm (18 lb-ft).



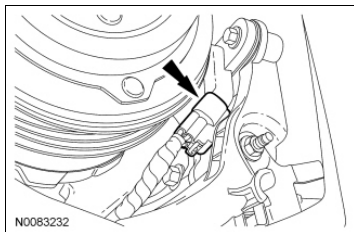
21. Connect the A/C compressor electrical connector.



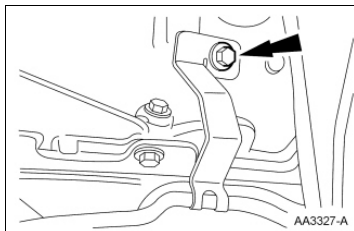
22. Connect the engine wiring harness retainers to the A/C compressor.



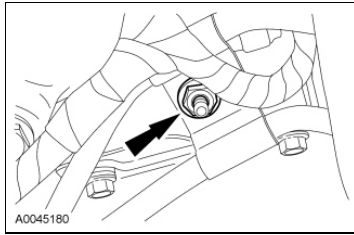
23. Connect the Crankshaft Position (CKP) sensor electrical connector.



24. Position the transmission oil cooler tube bracket and install the bolt.  
• Tighten to 15 Nm (133 lb-in).

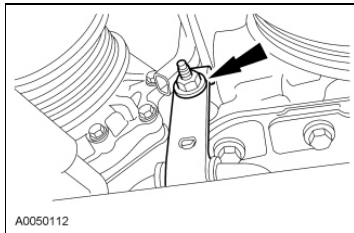


25. Install the transmission cooler tube support bracket.  
• Tighten to 9 Nm (80 lb-in).



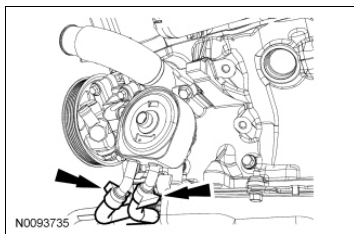
26. Install the power steering tube bracket.

- Tighten to 10 Nm (89 lb-in).

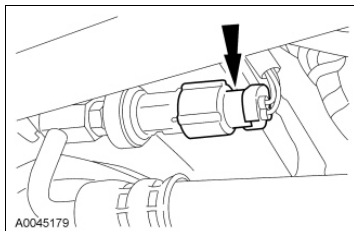


27. If equipped, connect the 2 coolant hoses to the oil cooler.

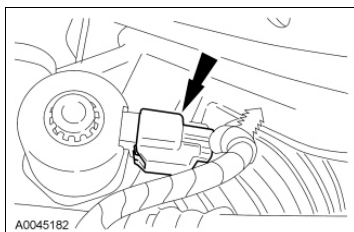
- Align the white lines on the coolant hoses with the black dots on the cooler tubes.



28. Connect the Power Steering Pressure (PSP) switch electrical connector.

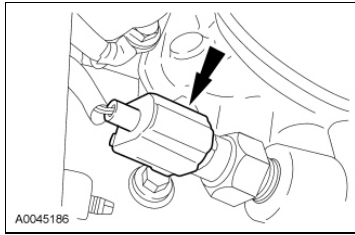


29. Connect the power steering electrical connector.

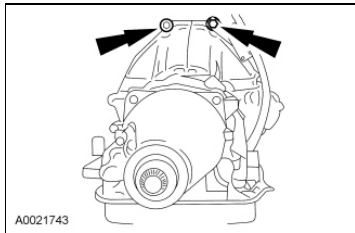


30. If equipped, connect the block heater electrical connector.

31. Connect the EOP switch electrical connector.



32. Install the 2 top transmission bellhousing bolts.
- Tighten to 48 Nm (35 lb-ft).



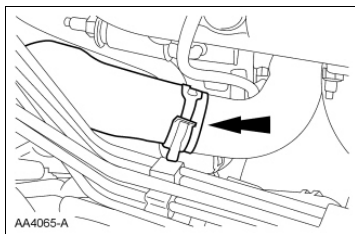
33. **NOTE:** Lubricate the oil filter seal with clean engine oil.

Install the oil filter.

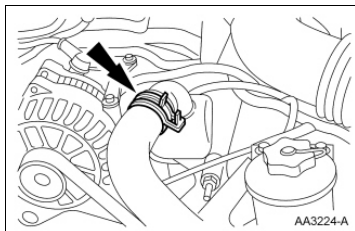
34. Install the cooling fan. For additional information, refer to [Section 303-03](#).

35. **NOTE:** Do not reuse hose clamps. Use appropriately sized worm-style clamps in place of the constant tension clamps.

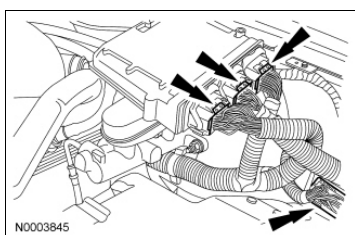
Connect the lower radiator hose.



36. Connect the upper radiator hose to the hose connection.

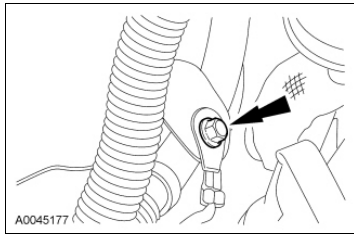


37. Connect the PCM electrical connectors.



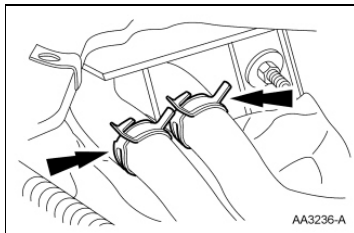
38. Position the ground strap and install the bolt.

- Tighten to 10 Nm (89 lb-in).

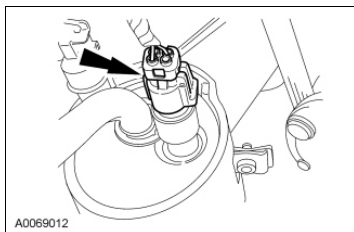


39. **NOTE:** Do not reuse hose clamps. Use appropriately sized worm-style clamps in place of the constant tension clamps.

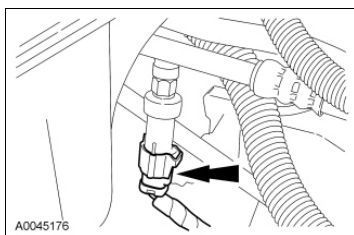
Connect the heater hoses.



40. Connect the A/C low charge protection switch electrical connector.

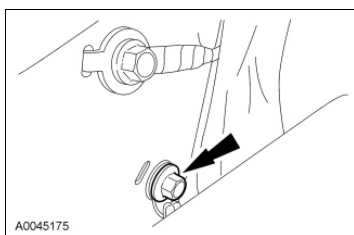


41. Connect the A/C electrical connector.



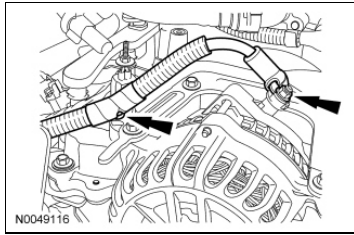
42. Install the ground strap and the bolt.

- Tighten to 10 Nm (89 lb-in).

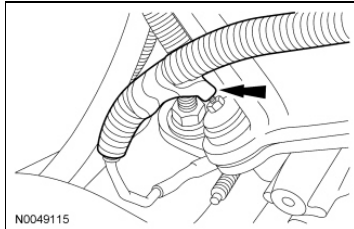


43. Attach the pin-type retainer and install the generator battery cable and nut.

- Tighten to 9 Nm (80 lb-in).

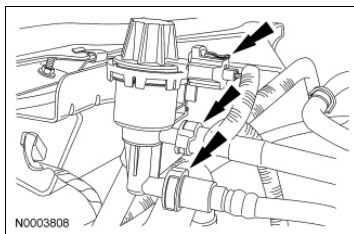


44. Attach the generator battery cable retainer to the RH valve cover stud bolt.

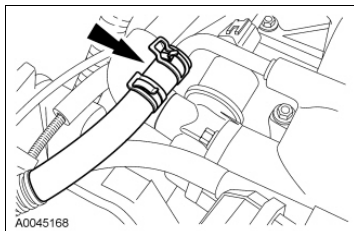


45. Connect the fuel tube spring lock coupling. For additional information, refer to [Section 310-00](#).

46. Connect the 2 hoses and the Evaporative Emission (EVAP) canister purge valve electrical connection.



47. Connect the vacuum hose.

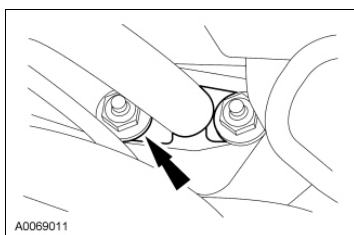


48. Install the Air Cleaner (ACL) and outlet pipe. For additional information, refer to [Section 303-12](#).


49. Install the accessory drive belt. For additional information, refer to [Section 303-05](#).

50. Install the support bracket and the 2 nuts.

- Tighten to 10 Nm (89 lb-in).



51. Install the wiper mounting arm and pivot shaft. For additional information, refer to [Section 501-16](#).

52. Fill the crankcase with clean engine oil.
53. Connect both battery cables. For additional information, refer to Section 414-00 .
54. Fill and bleed the cooling system. For additional information, refer to Section 303-03 .
55. Install the hood.
56.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Material

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-B (Canada)	WSS-M97B51-A1	17.9L (18.9qt)
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A	-

## General Specifications

Item	Specification
<b>Pressure Tests</b>	
Complete cooling system maximum pressure	110 kPa (16 psi)
Pressure relief cap (opening pressure)	110 kPa (16 psi)
Radiator (out of vehicle)	138 kPa (20 psi)
<b>Thermostat Opening Temperatures</b>	
Starts to open	87-91°C (188-195°F)
Fully open	100°C (212°F)

## Torque Specifications

Description	Nm	lb-ft	lb-in
A/C condenser-to-radiator bolt	10	-	89
Block heater screw	2	-	18
Coolant outlet adapter bolts	25	18	-
Coolant pump bolts	25	18	-
Coolant pump pulley bolts	25	18	-
Cooling fan motor and shroud bolts	10	-	89
Degas bottle bolt	10	-	89
Power steering reservoir bolt	10	-	89
Radiator support bracket bolts	10	-	89
Transmission cooler tubes	20	-	177





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## Engine Cooling

**NOTICE:** The cooling system is filled with Motorcraft® Premium Gold Engine Coolant or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the manufacturer's specified coolant. If a non-specified coolant has been used the cooling system must be chemically flushed. Refer to Cooling System Flushing in this section. Failure to follow these instructions may damage the engine or cooling system.

**NOTE:** If cooling system stop leak pellets are used, Motorcraft Premium Gold Engine Coolant may darken from yellow to golden tan.

The cooling system consists of the following components:

- Block heater (if equipped)
- Engine Coolant Temperature (ECT) sensor
- Fan blade, fan motor and fan shroud assembly
- Radiator
- Pressure relief cap
- Radiator draincock
- Coolant pump
- Coolant temperature indicator sender unit
- Coolant thermostat
- Oil filter adapter
- Radiator overflow hose

The radiator allows excess engine heat to be transferred to the air.

Radiator tanks cannot be repaired.

Engine coolant provides freeze protection, boil protection, cooling efficiency and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.

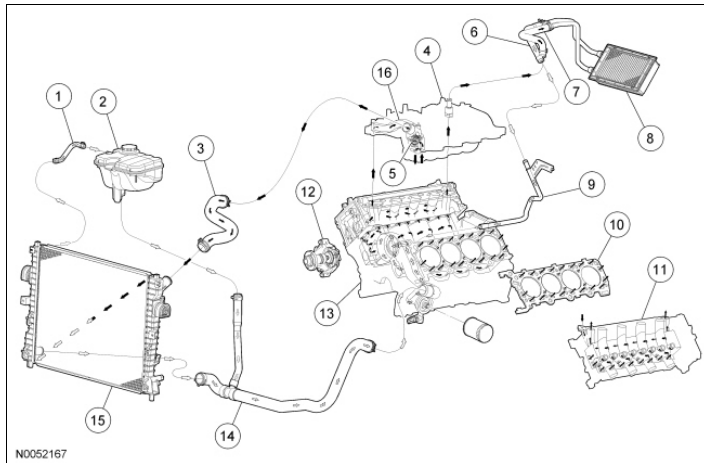
When adding engine coolant, use a 50/50 mixture of engine coolant and distilled water. A coolant concentration of 50% will provide freeze point protection down to -37°C (-34°F).

To maintain the integrity of the coolant and the cooling system:

- Add Motorcraft® Premium Gold Engine Coolant or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color).
- Do not add or mix different coolant types. Mixing coolants degrades the coolant's corrosion protection.
- Do not add alcohol, methanol, brine or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
- Ford Motor Company does NOT recommend the use of recycled engine coolant in vehicles equipped with Motorcraft® Premium Gold Engine Coolant since a Ford-approved recycling process is not yet available.

### Coolant Flow Diagram - Without Oil Cooler

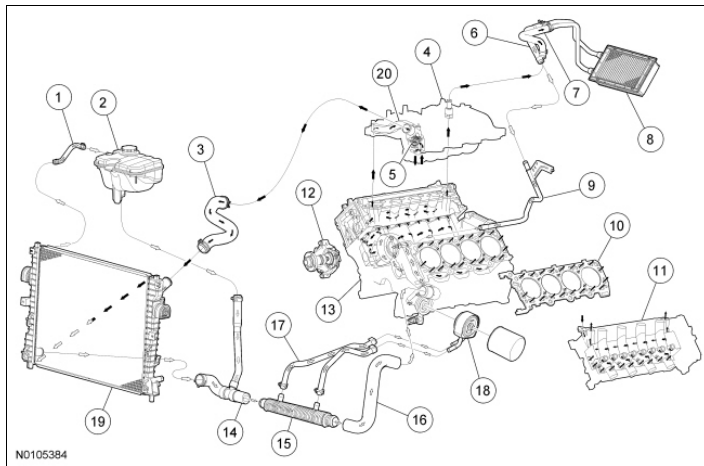
**NOTE:** Black arrows indicate hot, white arrows indicate cold.



Item	Part Number	Description
1	8W005	Degas bottle-to-radiator hose
2	8A080	Degas bottle
3	8B274	Upper radiator hose
4	9424	Intake manifold
5	8575	Thermostat
6	18K580	Heater core outlet hose
7	18K579	Heater core inlet hose
8	18B539	Heater core
9	18663	Heater core return tube
10	6083	Cylinder head gasket
11	6049	Cylinder head
12	8501	Coolant pump
13	6010	Engine block
14	8B273	Lower radiator hose
15	8005	Radiator
16	8C368	Coolant crossover manifold assembly

#### Coolant Flow Diagram - With Oil Cooler

**NOTE:** Black arrows indicate hot, white arrows indicate cold.







Item	Part Number	Description
1	8W005	Degas bottle-to-radiator hose
2	8A080	Degas bottle
3	8B274	Upper radiator hose
4	9424	Intake manifold
5	8575	Thermostat
6	18K580	Heater core outlet hose
7	18K579	Heater core inlet hose
8	18B539	Heater core
9	18663	Heater core return tube
10	6083	Cylinder head gasket
11	6049	Cylinder head
12	8501	Coolant pump
13	6010	Engine block
14	8B273	Lower radiator hose
15	-	Oil cooler coolant tube
16	8B273	Lower radiator hose
17	8B273	Oil cooler coolant hoses
18	6890	Oil cooler
19	8005	Radiator
20	8C368	Coolant crossover manifold assembly



**Engine Cooling**

## Special Tool(s)

 ST1720-A	Coolant/Battery Refractometer 023-00164 or equivalent
 ST1474-A	Pressure Test Kit 014-R1072 or equivalent
 ST3254-A	UView® Combustion Leak Tester UVU560000-R or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware or equivalent scan tool

## Material

Item	Specification
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-B (Canada)	WSS-M97B51-A1

**Principles of Operation**

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. From the coolant pump, coolant is sent through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump is operated by engine rotation through a pulley which is driven by the accessory drive belt to circulate the coolant. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant is allowed to flow through the radiator circuit in order to transfer engine-generated heat to the outside air.

The degas bottle holds surplus coolant and removes air from the cooling system, which reduces hot spots. It also allows for coolant expansion and system pressurization, replenishes coolant to the cooling system and serves as the location for service fill.

The cooling fan draws air through the radiator to help cool the system coolant as it passes through the radiator.

The thermostat monitor is a function of the PCM and is designed to verify correct thermostat operation. The monitor will be executed once per drive cycle and has a monitor run duration of 300-800 seconds. If a malfunction occurs, DTC P0125 or P0128 is set, and the Malfunction Indicator Lamp (MIL) will be illuminated.

For vehicle/engine specific information, refer to Engine Cooling in the Description and Operation portion of

this section.

### Inspection and Verification

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** The engine cooling system is filled with Motorcraft® Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft® Premium Gold Engine Coolant. Do not mix coolant types. Failure to follow these instructions may result in engine or cooling system damage.

**NOTE:** Vehicles have the pressure relief cap on the degas bottle and no radiator cap.

1. Verify the customer concern.
2. Visually check the engine coolant level at the degas bottle or coolant expansion tank when the system is cold.
3. Make sure the pressure relief cap is installed correctly.
4. Record any cooling system DTCs retrieved. Refer to the PCM DTC Chart in this section for DTC descriptions.
5. **NOTE:** Take note of any coolant odor or steam coming from cooling system components.

If the system coolant is filled correctly and no DTCs associated with fail-safe cooling are retrieved, verify the customer's concern by operating the engine to duplicate the condition.

6. **NOTE:** Refer to the coolant flow diagram in the Description and Operation Engine Cooling portion of this section.

Inspect to determine if any of the following mechanical or electrical concerns apply.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Leaks or weeps at:               <ul style="list-style-type: none"> <li>◆ Hoses</li> <li>◆ Tubes</li> <li>◆ Clamp joints</li> <li>◆ Quick connect couplings (if equipped)</li> <li>◆ Gaskets</li> <li>◆ O-rings</li> <li>◆ Thermostat housing</li> <li>◆ Radiator</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Inoperative or damaged:               <ul style="list-style-type: none"> <li>◆ Electric cooling fan</li> <li>◆ Wiring, connectors, relays or modules</li> <li>◆ Cylinder Head Temperature (CHT) sensor</li> <li>◆ Vehicle Speed Sensor (VSS)</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>◆ Pressure relief cap</li> <li>◆ Coolant pump</li> <li>◆ Heater core (wet floor or coolant odor in vehicle)</li> <li>◆ Oil cooler (if equipped)</li> <li>◆ Degas bottle</li> <li>◆ Cylinder block core plugs</li> <li>◆ Cylinder head core plugs</li> <li>◆ Block heater (if equipped)</li> </ul>	
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**Visual Inspection Chart**

<b>Mechanical</b>	<b>Electrical</b>
<ul style="list-style-type: none"> <li>• Cracked or damaged: <ul style="list-style-type: none"> <li>◆ Hoses</li> <li>◆ Tubes</li> <li>◆ Hose clamps</li> <li>◆ Thermostat housing</li> <li>◆ Radiator</li> <li>◆ Pressure relief cap</li> <li>◆ Cooling fan</li> <li>◆ Coolant pump</li> <li>◆ Degas bottle</li> <li>◆ Oil cooler (if equipped)</li> <li>◆ Cylinder block core plugs</li> <li>◆ Cylinder head core plugs</li> <li>◆ Block heater (if equipped)</li> </ul> </li> <li>• Restricted airflow through the A/C condenser/radiator</li> <li>• Drive belt loose, worn or installed incorrectly</li> <li>• Broken or weak drive belt tensioner</li> <li>• Excessive white or light gray exhaust smoke (may have burnt coolant odor)</li> <li>• Coolant in engine oil</li> <li>• Engine oil in coolant</li> </ul>	â

7. If the inspection reveals an obvious concern that can be readily identified, repair it as necessary. Test the system for normal operation.

8. Inspect the coolant condition in the following sequence:

1. Inspect the coolant color.

- ◆ If Motorcraft® Premium Gold Engine Coolant has a clear or pale yellow color, this indicates higher water content than required. Test the engine coolant freezing point range with the Coolant/Battery Refractometer. The freezing point should be in the range -45°C to -23°C (-49°F to -9°F). If the vehicle is driven in cold climates less than -36°C (-33°F), it may be necessary to increase the coolant concentration to get adequate freeze protection. Recommended coolant concentration is 50/50 ethylene glycol to distilled water.
- ◆ A pale green color indicates incorrect coolant (green in color) may have been added to the system. Use of incorrect (green in color) coolant degrades the corrosion



protection of Motorcraft® Premium Gold Engine Coolant. Flush the system and refill with the correct mixture of distilled water and Motorcraft® Premium Gold Engine Coolant.

- ◆ **NOTE:** If cooling system stop leak pellets are used, Motorcraft Premium Gold Engine Coolant may darken from yellow to golden tan.

Dark brown coolant could indicate a commercially available stop leak may have been used. Flush the system and refill with the correct mixture of distilled water and Motorcraft® Premium Gold Engine Coolant.

- ◆ A light or reddish brown color indicates that rust may be present in the cooling system. Flush the system and refill with the correct mixture of distilled water and Motorcraft® Premium Gold Engine Coolant.
- ◆ An iridescent sheen on top of the coolant could indicate a trace of oil is entering the system. For information on engine diagnosis, refer to Section 303-00.
- ◆ A milky brown color may indicate that engine oil is entering the cooling system. Pressure test the cooling system. Refer to Component Tests in this section. If engine oil is suspected, the cause of the leak may be internal to the engine. Refer to Section 303-00.

2. If the engine coolant appearance is acceptable, test the engine coolant freezing point range with the Coolant/Battery Refractometer. The freezing point should be in the range -45°C to -23°C (-49°F to -9°F). If the vehicle is driven in cold climates less than -36°C (-33°F), it may be necessary to increase the coolant concentration to get adequate freeze protection. Recommended coolant concentration is 50/50 ethylene glycol to distilled water.
  - ◆ Maximum coolant concentration is 60/40 for cold weather areas.
  - ◆ Minimum coolant concentration is 40/60 for warm weather areas.
3. Adjust coolant range and level if necessary:
  - ◆ If coolant is low, add specified coolant mixture only.
  - ◆ If the engine coolant tests too weak, remove some of the engine coolant and add undiluted engine coolant until the readings are within acceptable levels.
  - ◆ If the engine coolant tests strong, remove some of the engine coolant and add distilled water until the readings are within acceptable levels.

9. If an obvious cause for an observed or reported concern is found, correct the cause and test the system for normal operation before proceeding to the next step.

10. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

11. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM.

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM.
- refer to Section 418-00, No Power To The Scan Tool, to diagnose no power to the scan tool.

12. If the scan tool does not communicate with the vehicle:
  - verify the ignition key is in the ON position.
  - verify the scan tool operation with a known good vehicle.
  - refer to Section 418-00 to diagnose no response from the PCM.

13. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#) .
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

14. Clear the continuous DTCs and carry out the self-test diagnostics PCM.

15. If the DTCs recovered are related to the concern, go to the PCM DTC Chart. For all other DTCs, refer to [Section 419-10](#) .

16. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#) .

## DTC Chart

### PCM DTC Chart

DTC	Description	Action
P0217	Engine Coolant Overtemperature Condition	<a href="#">GO to Pinpoint Test B</a> .
P1285	Cylinder Head Overtemperature Condition	<a href="#">GO to Pinpoint Test B</a> .
P1299	Cylinder Head Overtemperature Protection Active	<a href="#">GO to Pinpoint Test B</a> .
P0125	Insufficient Coolant Temp For Closed Loop Fuel Control	<a href="#">GO to Pinpoint Test C</a> .
P0128	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)	<a href="#">GO to Pinpoint Test C</a> .
P0480 P0481 P0482	Fan 1, 2 or 3 Control Circuit, Respectively	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
All Other DTCs	â	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

## Symptom Chart

Symptom Chart

### Pinpoint Tests

#### Pinpoint Test A: Loss of Coolant

##### Normal Operation

The engine cooling system is a closed system that provides for coolant expansion and contraction and also changes in pressure as coolant warms and cools with engine operation. Various gaskets, seals, hoses and clamps are used to contain coolant within the cooling system and keep other fluids and contaminants from entering the cooling system.

Normal Operation

Coolant loss can be attributed to either external or internal leaks anywhere within the cooling system.

For vehicle/engine specific information, refer to Engine Cooling in the Description and Operation portion of this section.

**This pinpoint test is intended to diagnose the following:**

- Coolant hoses or tubes
- Hose clamps
- Thermostat O-ring seal or gasket
- Coolant pump O-ring seal or gasket
- Thermostat housing
- Radiator
- Pressure relief cap
- Coolant pump leaking from weep hole
- Heater core
- Engine gaskets
- Oil cooler (if equipped)
- Degas bottle
- Cylinder block core plugs
- Cylinder head core plugs
- Block heater (if equipped)

**PINPOINT TEST A: LOSS OF COOLANT**

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

Test Step	Result / Action to Take
<b>A1 CARRY OUT INSPECTION AND VERIFICATION</b>	
<ul style="list-style-type: none"> <li>• Carry out the Inspection and Verification procedure in this section.</li> <li>• <b>Were any concerns found?</b></li> </ul>	<p><b>Yes</b> REPAIR as needed. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE ENGINE COOLANT LEVEL</b>	
<p><b>NOTE:</b> Allow the engine to cool before checking the engine coolant level.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Visually inspect the engine coolant level at the degas bottle.</li> <li>• <b>Is the engine coolant level within specifications?</b></li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> ADJUST the engine coolant level as necessary. GO to <u>A3</u> .</p>
<b>A3 PRESSURE TEST THE ENGINE COOLING SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Pressure test the engine cooling system. Refer to Component Tests, Cooling System Pressure Test in this section.</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL new components. TEST the system for normal operation.</p>

<ul style="list-style-type: none"> <li>• <b>Does the engine cooling system leak externally?</b></li> </ul>	<b>No</b> GO to <a href="#">A4</a> .
<b>A4 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK</b>	
<ul style="list-style-type: none"> <li>• Inspect the engine coolant in the degas bottle for signs of engine oil.</li> <li>• <b>Is engine oil evident in the coolant?</b></li> </ul>	<b>Yes</b> GO to <a href="#">Section 303-00</a> for engine diagnosis.  <b>No</b> GO to <a href="#">A5</a> .
<b>A5 CHECK THE ENGINE OIL FOR COOLANT</b>	
<ul style="list-style-type: none"> <li>• Remove the oil level indicator from the engine.</li> <li>• <b>Is coolant evident in the oil?</b></li> </ul>	<b>Yes</b> GO to <a href="#">Section 303-00</a> for engine diagnosis.  <b>No</b> GO to <a href="#">A6</a> .
<b>A6 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> Use UViewÂ® Combustion Leak Tester, part No. UVU560000-R or equivalent.</li> <li>• Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases.</li> <li>• <b>Are combustion gases present?</b></li> </ul>	<b>Yes</b> GO to <a href="#">Section 303-00</a> for engine diagnosis.  <b>No</b> The cooling system is operational.

## Pinpoint Test B: The Engine Overheats

### Normal Operation

The engine cooling system functions to maintain engine temperatures during operation. Correct coolant flow through the engine, radiator and remainder of cooling system passages and components is essential to maintaining a correct engine temperature.

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. From the coolant pump, coolant is sent through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump is operated by engine rotation through a pulley which is driven by the accessory drive belt to circulate the coolant. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant is allowed to flow through the radiator circuit in order to transfer engine-generated heat to the outside air.

Engine overheating generally occurs when there is a disruption in the ability to control either coolant flow at the correct rate, the inability to transfer heat from the engine through the coolant (including low coolant) or an inability to transfer engine-generated heat to the outside air through the radiator.

For vehicle/engine specific information, refer to [Engine Cooling](#) in the Description and Operation portion of this section.

- DTC P0217 (Engine Coolant Overtemperature Condition) â Indicates an engine overheat condition was sensed by the Cylinder Head Temperature (CHT) sensor.
- DTC P1225 (Cylinder Head Overtemperature Condition) â Indicates an engine overheat condition was sensed by the CHT sensor.
- DTC P1299 (Cylinder Head Overtemperature Protection Active) â Indicates an engine overheat condition was detected by the CHT sensor. A failure mode effects management strategy called fail-safe cooling was activated to cool the engine.

**This pinpoint test is intended to diagnose the following:**

- Low coolant level
- External engine coolant leak
- Airlock in system
- Pressure relief cap installation
- Restricted airflow through the A/C condenser/radiator
- Internal engine coolant leak
- Coolant condition/concentration
- Accessory drive components
- Non-OEM engine enhancement components
- Electric cooling fan
- Engine Coolant Temperature (ECT) indicator system (gauge)
- CHT sensor
- Heater core
- Coolant pump
- Coolant flow restriction

**PINPOINT TEST B: THE ENGINE OVERHEATS**

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

Test Step	Result / Action to Take
<b>B1 CARRY OUT INSPECTION AND VERIFICATION</b>	
<ul style="list-style-type: none"> <li>• Carry out the Inspection and Verification procedure in this section.</li> <li>• <b>Were any concerns found?</b></li> </ul>	<p><b>Yes</b> REPAIR as needed. TEST the system for normal operation.</p> <p><b>No</b> GO to <b>B2</b> .</p>
<b>B2 CHECK FOR DTCs</b>	
<ul style="list-style-type: none"> <li>• Check for DTC P0217, P1285 or P1299.</li> <li>• <b>Is DTC P0217, P1285 or P1299 present?</b></li> </ul>	<p><b>Yes</b> GO to <b>B3</b> .</p> <p><b>No</b> Actual engine overheating has not been verified. CHECK the ECT gauge operation. REFER to <b>Section 413-01</b> . If any other DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p>
<b>B3 CHECK FOR AN AIRFLOW OBSTRUCTION</b>	

<ul style="list-style-type: none"> <li>• Check the radiator or A/C condenser for an external obstruction such as leaves or cardboard.</li> <li>• <b>Is an obstruction present?</b></li> </ul>	<p><b>Yes</b> REMOVE the obstruction. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>B4</u> .</p>
<b>B4 CHECK THE ENGINE COOLANT LEVEL</b>	
<p><b>NOTE:</b> Allow the engine to cool before checking the coolant level.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Visually check the engine coolant level in the degas bottle.</li> <li>• <b>Is the engine coolant level within specification?</b></li> </ul>	<p><b>Yes</b> GO to <u>B5</u> .</p> <p><b>No</b> ADJUST the engine coolant level as necessary. GO to <u>B5</u> .</p>
<b>B5 PRESSURE TEST THE ENGINE COOLING SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Pressure test the engine cooling system. Refer to Component Tests, Cooling System Pressure Test in this section.</li> <li>• <b>Does the engine cooling system leak externally?</b></li> </ul>	<p><b>Yes</b> REPAIR or INSTALL new components. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>B6</u> .</p>
<b>B6 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK</b>	
<ul style="list-style-type: none"> <li>• Inspect the engine coolant in the degas bottle for signs of engine oil.</li> <li>• <b>Is engine oil evident in the coolant?</b></li> </ul>	<p><b>Yes</b> GO to <u>Section 303-00</u> for engine diagnosis.</p> <p><b>No</b> GO to <u>B7</u> .</p>
<b>B7 CHECK THE ENGINE OIL FOR COOLANT</b>	
<ul style="list-style-type: none"> <li>• Remove the oil level indicator from the engine.</li> <li>• <b>Is coolant evident in the oil?</b></li> </ul>	<p><b>Yes</b> GO to <u>Section 303-00</u> for engine diagnosis.</p> <p><b>No</b> GO to <u>B8</u> .</p>
<b>B8 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> Use UView<sup>®</sup> Combustion Leak Tester, part No. UVU560000-R or equivalent.</li> <li>• Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases.</li> <li>• <b>Are combustion gases present?</b></li> </ul>	<p><b>Yes</b> GO to <u>Section 303-00</u> for engine diagnosis.</p> <p><b>No</b> GO to <u>B9</u> .</p>

<b>B9 CHECK COOLANT CONDITION</b>	
<ul style="list-style-type: none"> <li>• Check the coolant for dirt, rust or contamination and check the coolant concentration.</li> <li>• <b>Is the coolant condition OK?</b></li> </ul>	<p><b>Yes</b> GO to <b>B10</b> .</p> <p><b>No</b> FLUSH the engine cooling system. REFER to <u>Cooling System Flushing</u> in this section. TEST the system for normal operation.</p>
<b>B10 CHECK THE ELECTRIC COOLING FAN OPERATION</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Place the climate control function selector in the MAX A/C position and the blower motor switch in the HI position.</li> <li>• <b>Did the electric cooling fan operate?</b></li> </ul>	<p><b>Yes</b> GO to <b>B11</b> .</p> <p><b>No</b> DIAGNOSE the electric cooling fan operation. REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p>
<b>B11 CHECK THE COOLANT PUMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Allow the engine to run for 10 minutes. Place the climate control function selector in the MAX HEAT position. Feel the heater outlet hose.</li> <li>• <b>Is the heater outlet hose hot?</b></li> </ul>	<p><b>Yes</b> GO to <b>B12</b> .</p> <p><b>No</b> INSTALL a new coolant pump. TEST the system for normal operation.</p>
<b>B12 CHECK THE THERMOSTAT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Allow the engine to run for 10 minutes. Feel the upper radiator hose.</li> <li>• <b>Is the upper radiator hose hot?</b></li> </ul>	<p><b>Yes</b> CHECK the engine coolant temperature gauge operation. REFER to <u>Section 413-01</u> .</p> <p><b>No</b> GO to <b>B13</b> .</p>
<b>B13 VISUALLY INSPECT THE THERMOSTAT</b>	
<ul style="list-style-type: none"> <li>• Carry out the Thermostat Visual Inspection in the Component Tests portion of this section.</li> <li>• <b>Is the thermostat damaged?</b></li> </ul>	<p><b>Yes</b> INSTALL a new thermostat. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new thermostat. TEST the system for normal operation. If the engine still overheats, INSTALL a new radiator. TEST the system for normal operation.</p>

**Pinpoint Test C: The Engine Does Not Reach Normal Operating Temperature**

## Normal Operation

The engine cooling system functions to maintain engine temperatures during operation. Correct coolant flow through the engine, radiator and remainder of cooling system passages and components is essential to maintaining a correct engine temperature.

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. From the coolant pump, coolant is sent through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. The coolant pump is operated by engine rotation through a pulley which is driven by the accessory drive belt to circulate the coolant. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant is allowed to flow through the radiator circuit in order to transfer engine generated heat to the outside air.

Concerns of engine inability to reach normal operating temperature typically occur when the rate of coolant flow through some coolant circuits (radiator, heater core) is more than expected given the conditions, or when the electric cooling fans operate all the time. Heat is not allowed to build in the engine because a heat exchanger is removing too much heat, including the radiator, heater core and oil cooler. In addition, perceived concerns that the engine does not reach normal operating temperature can be related to a low coolant level or trapped air which does not allow for hot coolant to be available at the heater core, an inoperative climate control system, or for concerns perceived or related to an incorrect engine temperature gauge indication.

For vehicle/engine specific information, refer to Engine Cooling in the Description and Operation portion of this section.

- DTC P0125 (Insufficient Coolant Temp for Closed Loop Fuel Control) â Indicates the Cylinder Head Temperature (CHT) sensor has not achieved the required temperature level to enter closed loop operating conditions within a specified amount of time after starting the engine.
- DTC P0128 (Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)) â Indicates that the thermostat monitor has not achieved the required engine operating temperature within a specified amount of time after starting the engine.

### **This pinpoint test is intended to diagnose the following:**

- Low coolant level
- Thermostat
- Engine Coolant Temperature (ECT) indicator system (gauge)
- Engine cooling fan

## **PINPOINT TEST C: THE ENGINE DOES NOT REACH NORMAL OPERATING TEMPERATURE**

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

Test Step	Result / Action to Take
<b>C1 CARRY OUT INSPECTION AND VERIFICATION</b>	
<ul style="list-style-type: none"> <li>• Carry out the Inspection and Verification procedure in this section.</li> </ul>	<b>Yes</b> REPAIR as needed. TEST the system for normal operation.  <b>No</b>



<ul style="list-style-type: none"> <li>• Were any concerns found?</li> </ul>	GO to <u>C2</u> .
<b>C2 CHECK FOR DTCs P0125 or P0128</b>	
<ul style="list-style-type: none"> <li>• Check for DTC P0125 or P0128.</li> <li>• Is DTC P0125 or P0128 present?</li> </ul>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> The cooling system is operational. If an inoperative engine coolant temperature gauge is suspected, CHECK the engine coolant temperature gauge operation. REFER to <u>Section 413-01</u> . If an inoperative climate control system is suspected, CHECK the climate control system operation. REFER to <u>Section 412-00</u> . If any other DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p>
<b>C3 CHECK THE ELECTRIC COOLING FAN OPERATION</b>	
<ul style="list-style-type: none"> <li>• Allow the engine to cool.</li> <li>• Make sure the A/C switch is OFF (if equipped).</li> <li>• Start the engine.</li> <li>• Check the electric cooling fan.</li> <li>• Is the electric cooling fan on all the time?</li> </ul>	<p><b>Yes</b> DIAGNOSE the electric cooling fan operation. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>C4</u> .</p>
<b>C4 CHECK THE COOLANT LEVEL</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> Allow the engine to cool before checking the coolant level.</li> <li>• Visually check the engine coolant level in the degas bottle.</li> <li>• Is the engine coolant level within specification?</li> </ul>	<p><b>Yes</b> INSTALL a new thermostat. TEST the system for normal operation.</p> <p><b>No</b> <u>GO to Pinpoint Test A</u> to diagnose a coolant leak.</p>

## Component Tests

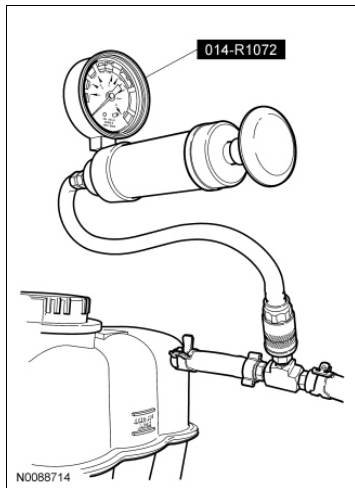
### Cooling System Pressure Test

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

**NOTE:** Vehicles have the pressure relief cap on the degas bottle and no radiator cap.

1. Turn the engine OFF.
2. Check the engine coolant level. Adjust the coolant level as necessary.

3. Attach the Pressure Test Kit to the degas bottle nipple and overflow hose. Install a pressure test pump to the quick connect fitting of the test adapter.



4. **NOTICE:** Do not pressurize the cooling system beyond the maximum pressure listed in the specifications table in this section or cooling system components may be damaged.

**NOTE:** If the plunger of the pressure tester is depressed too fast, an erroneous pressure reading will result.

Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained. If the pressure reading exceeds the maximum cap pressure listed in the specifications table, install a new pressure relief cap.

5. If the system does not hold pressure, remove the pressure relief cap and wash in clean water to dislodge all the foreign material from the gasket. Check the sealing surface in the filler neck of the degas bottle for nicks or cuts. Install the pressure relief cap.
6. Pressurize the engine cooling system as described in Step 4 above. Observe the gauge reading for approximately 2 minutes. Pressure should not drop during this time. If the pressure drops within this time, inspect for leaks and repair as necessary.
7. If no leaks are found and the pressure drops, the pressure relief cap may be leaking. Install a new pressure relief cap and retest the system.
8. If no leaks are found after a new pressure relief cap is installed, and the pressure drops, the leak may be internal to the engine. Inspect the coolant for engine oil and the engine oil for coolant. Refer to Section 303-00 to diagnose the engine.
9. Release the system pressure by loosening the pressure relief cap. Check the coolant level and adjust as necessary.

## Thermostat

A new thermostat should be installed only after the following tests and checks have been carried out:

- Pinpoint Test A, B or C
- Thermostat Visual Inspection

## Thermostat Visual Inspection

1. Remove the thermostat.
2. Examine the thermostat for signs of damage including:
  - Valve not fully seated (light visible through the valve)
  - Foreign material lodged in the main valve
  - Bent or broken frame or flange
  - Bent or broken spring
  - Bent or broken valve or valve stem
  - Wax leaking from wax reservoir or a bulge in the reservoir
  - Any other damage or distortion
3. **NOTE:** If no damage is found during the inspection, do not attempt to open the thermostat using hot water or other heat sources. This method is not an accurate means to test the function of the thermostat and may damage the thermostat.

If damage is found during the inspection, remove any foreign material or broken pieces and install a new thermostat.
4. If no damage is found during the inspection, continue troubleshooting the system concern. Go to the Symptom Chart for further instructions.

#### **Radiator Leak Test, Removed From Vehicle**



**NOTICE:** Never leak test an aluminum radiator in the same water that copper/brass radiators are tested in. Flux and caustic cleaners may be present in the cleaning tank and they will damage aluminum radiators.

**NOTE:** Clean the radiator before leak testing to avoid contamination of tank.

1. Leak test the radiator in clean water with pressurized air to the maximum pressure listed in the Specifications.
-

**Cooling System Draining, Filling and Bleeding**

## Special Tool(s)

 ST1720-A	Battery/Antifreeze Tester 014-R1060 or equivalent
 ST2816-A	RADKITPLUS 078-00497

## Material

Item	Specification
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-B (Canada)	WSS-M97B51-A1

**Draining**

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated it must be recycled or disposed of correctly and replaced. Using contaminated coolant may damage cooling system components or the engine.

**NOTICE:** Vehicle cooling systems are filled with Motorcraft® Premium Gold Engine Coolant or equivalent (yellow color) meeting Ford specification WSS-M97B51-A1. Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types. Mixing coolants may degrade the coolant's corrosion protection.

**NOTE:** Less than 80% of coolant capacity can be recovered with the engine in the vehicle. Dirty, rusty or contaminated coolant requires the system flush and replacement.

1. Release the pressure in the cooling system by slowly turning the pressure relief cap 1/2 turn counterclockwise. When the pressure is released, remove the pressure relief cap.
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Place a suitable container below the radiator draincock and drain the radiator.

3. Close the radiator draincock.

4. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

### Filling and Bleeding with RADKITPLUS

1. Install the RADKITPLUS and follow the manufacturer's instructions to fill and bleed the cooling system.

### Filling and Bleeding without RADKITPLUS

**NOTICE:** Engine coolant provides freeze protection, boil protection, cooling efficiency and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.

**When adding engine coolant, use a 50/50 mixture of clean, drinkable water and engine coolant.**

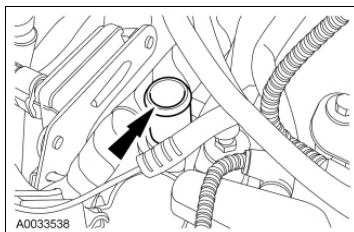
**To maintain the integrity of the coolant and the cooling system:**

- Add Motorcraft® Premium Gold Engine Coolant or equivalent (yellow color) meeting Ford specification WSS-M97B51-A1. Always fill the cooling system with the same type of coolant that was drained from the system. Do not mix coolant types. Mixing coolant types may degrade the coolant's corrosion protection.
- Do not add orange-colored Motorcraft® Specialty Orange Engine Coolant or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.
- Do not add alcohol, methanol, brine or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
- Ford Motor Company does NOT recommend the use of recycled engine coolant in vehicles.

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

Remove the thermostat. For additional information, refer to Thermostat in this section.

2. Disconnect the heater core coolant supply hose from the fitting at the rear of the manifold.
3. Add the coolant/water mixture through the thermostat opening until coolant appears at the heater core coolant supply outlet fitting at the rear of the manifold.



4. Install the heater hose, using an appropriately sized worm style clamp in place of the constant tension clamp.

5. Install the thermostat. For additional information, refer to Thermostat in this section.
6. Add the correct engine coolant mixture to the degas bottle until the coolant level is between the COOLANT FILL LEVEL marks and replace the pressure cap.
7. Select the maximum heater temperature and blower motor speed settings. Position the control to discharge air at the A/C vents in the instrument panel.
8. Run the engine until it reaches operating temperature.
9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

10. **NOTICE: If air discharge remains cool and the engine coolant temperature gauge does not move, the engine coolant level is low in the engine and must be filled. Stop the engine, allow it to cool and fill the cooling system. Failure to follow these instructions may result in damage to the engine.**

Add the correct engine coolant mixture to the degas bottle until the coolant level is between the COOLANT FILL LEVEL marks.

11. Repeat the 2 previous steps until the engine coolant mixture is between the COOLANT FILL LEVEL marks on the degas bottle. Turn off the engine and allow it to cool.
  12. Check the freeze protection of the engine coolant mixture with the Battery/Antifreeze Tester or equivalent. Adjust freezing point range if necessary. For additional information, refer to Engine Cooling in this section.
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**Cooling System Flushing**

## Material

Item	Specification
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Remove the coolant thermostat. For additional information, refer to Thermostat in this section.
3. Install the coolant hose connection without the coolant thermostat.
4. **NOTE:** Refer to the cooling system flusher manufacturer's operating instructions for specific vehicle hook-up.

Using an appropriate cooling system flusher, flush the engine and radiator.

Use Premium Cooling System Flush or equivalent meeting Ford specification. Always flush the cooling system with water thoroughly after using the flush and prior to filling the cooling system. Always fill the cooling system with the same coolant that was present in the system. Do not mix coolant types.

5. Install the coolant thermostat. For additional information, refer to Thermostat in this section.
6. Backflush the heater core. For additional information, refer to Heater Core Backflushing in this section.
7. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
8. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.





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**Heater Core Backflushing**

## Material

Item	Specification
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

**⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. **NOTE:** For additional information, refer to the cooling system flusher manufacturer's operating instructions for particular vehicle hook-up.

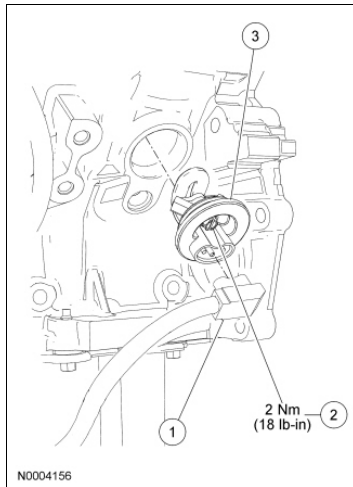
Use an appropriate cooling system flusher to backflush the heater core. Use Premium Cooling System Flush or equivalent meeting Ford specification. Flush with water thoroughly after using VC-1 or equivalent prior to refilling the cooling system.

3. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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**Block Heater**

Item	Part Number	Description
1	6B019	Block heater electrical connector
2	6A051	Block heater retaining screw
3	6A051	Block heater

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Drain the cooling system. For additional information, refer to [Cooling System Draining, Filling and Bleeding](#) in this section.
3. Disconnect the block heater electrical connector and position aside.
4. **NOTE:** Do not loosen the block heater retaining screw more than necessary for removal.

Loosen the block heater retaining screw and remove the block heater.

- To install, tighten to 2 Nm (18 lb-in).

5. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Make sure the block heater electrical connector is routed and secured away from rotating or hot components, or damage to the cable can occur.

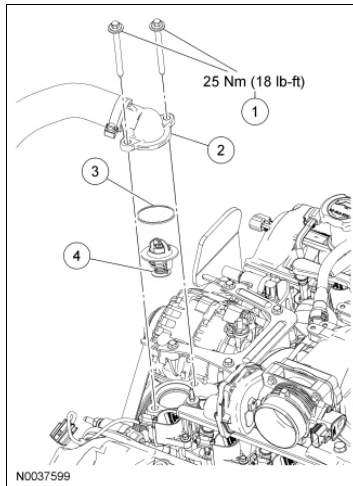
To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

6. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
-

**Thermostat**

## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-



Item	Part Number	Description
1	W704693	Coolant outlet adapter bolts (2 required)
2	8594	Coolant outlet adapter
3	N806807	O-ring seal
4	8575	Thermostat

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Drain the cooling system. For additional information, refer to [Cooling System Draining, Filling and Bleeding](#) in this section.

2. Remove the 2 bolts and position aside the coolant outlet adapter and hose.
  - To install, tighten to 25 Nm (18 lb-ft).
3. Remove the O-ring seal and the coolant thermostat from the intake manifold.
  - Discard the O-ring seal.
  - Clean all sealing surfaces with metal surface prep.
4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

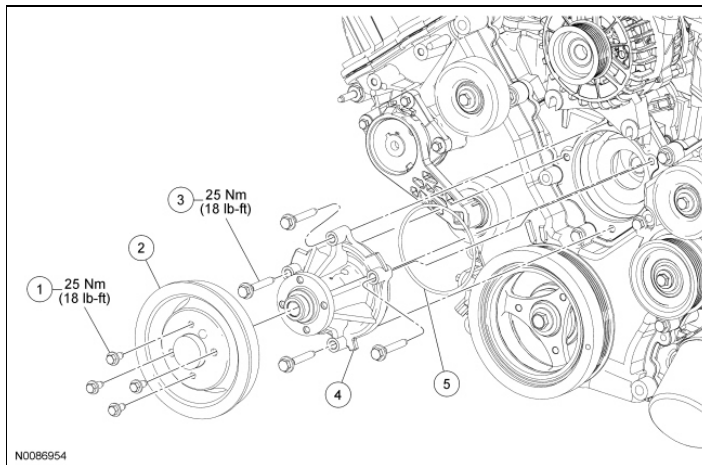
To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

5. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
-

**Coolant Pump**

## Material

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-B (Canada)	WSS-M97B51-A1



Item	Part Number	Description
1	N806282	Coolant pump pulley bolt (4 required)
2	8A528	Coolant pump pulley
3	N806177	Coolant pump bolt (4 required)
4	8501	Coolant pump
5	391108	Coolant pump O-ring seal


**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Drain the cooling system. For additional information, refer to [Cooling System Draining, Filling and Bleeding](#) in this section.

2. Loosen the 4 coolant pump pulley bolts.
3. Remove the accessory drive belt. For additional information, refer to [Section 303-05](#) .
4. Remove the 4 bolts and the coolant pump pulley.
  - To install, tighten to 25 Nm (18 lb-ft).
5. Remove the 4 bolts and the coolant pump.

- Discard the O-ring seal.
- To install, tighten to 25 Nm (18 lb-ft).

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not rotate the coolant pump housing once installed in the engine. Damage to the O-ring seal can occur, causing the coolant pump to leak.

**NOTE:** Align the mounting holes in the cylinder block with the mounting holes on the coolant pump prior to installing the coolant pump in the cylinder block.

**NOTE:** Install a new O-ring seal and lubricate with clean engine coolant.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Clean all sealing surfaces with metal surface prep.

7. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.
-

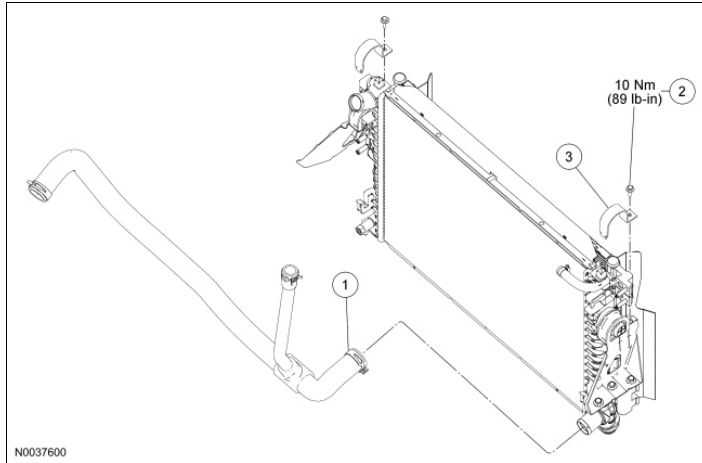


SECTION 303-03: Engine Cooling  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

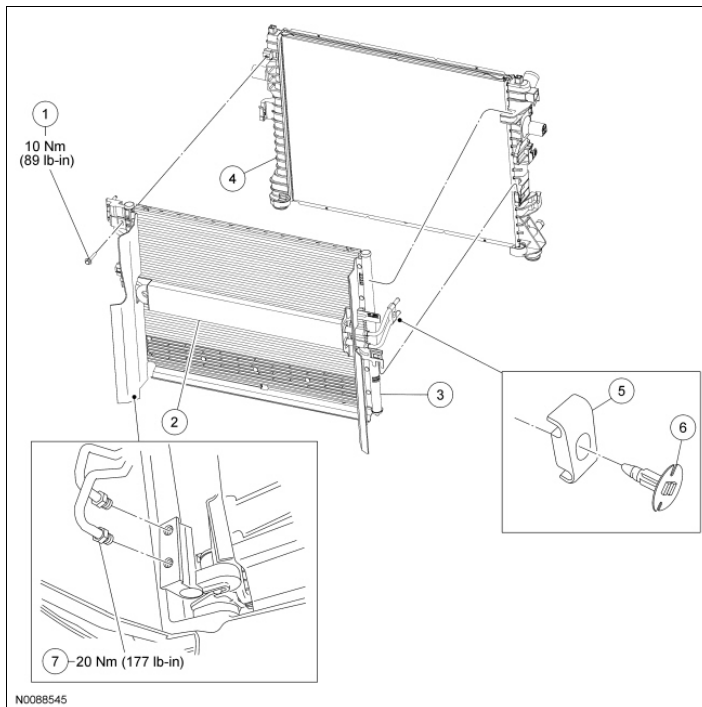
## Radiator

### Radiator (View 1 of 2)



Item	Part Number	Description
1	8B273	Lower radiator hose
2	W505424	Radiator support bracket bolt (2 required)
3	8A194	Radiator support bracket (2 required)

### Radiator (View 2 of 2)



Item	Part Number	Description
1	W505428	A/C condenser-to-radiator bolt

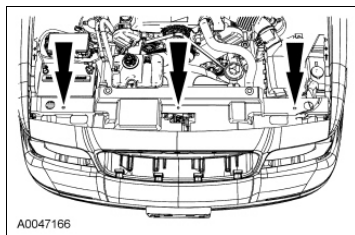
2	3D746	Power steering fluid cooler
3	19E908	A/C condenser
4	8005	Radiator
5	-	Power steering fluid cooler tube bracket
6	41201	Power steering fluid cooler pin-type retainer
7	7T028	Transmission cooler tube

### Removal and Installation

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

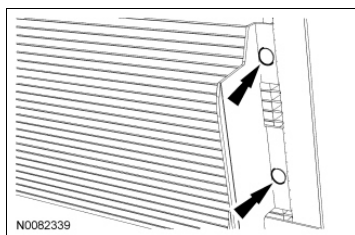
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A** .

2. Remove the cooling fan motor and shroud assembly. For additional information, refer to Cooling Fan Motor and Shroud in this section.
3. Remove the 3 pin-type retainers and remove the radiator sight shield.

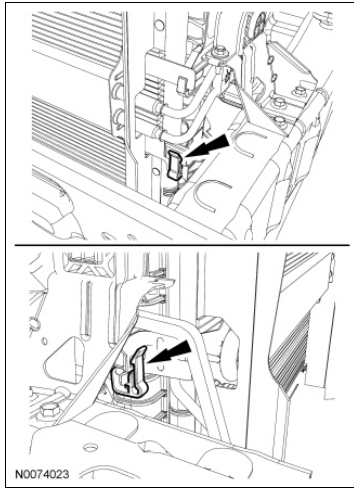


4. Disconnect the lower radiator hose and position aside.
5. Remove the 2 bolts and the 2 radiator support brackets.
  - To install, tighten to 10 Nm (89 lb-in).
6. **NOTE:** LH shown, RH similar.

Remove the top 2 LH and 2 RH pin-type retainers from the A/C condenser air deflectors.



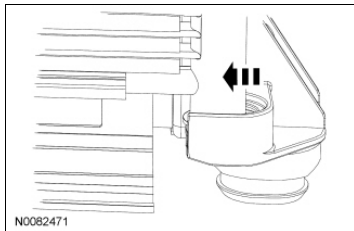
7. Disconnect the transmission cooler tubes from the transmission cooler and position aside.
  - To install, tighten to 20 Nm (177 lb-in).
8. Remove the pin-type retainer from radiator-to-power steering fluid cooler.
9. Remove the bolt from the A/C condenser.
  - To install, tighten to 10 Nm (89 lb-in).
10. Release the 2 retainer clips and separate the power steering fluid cooler from the radiator.



11. **NOTE:** LH shown, RH similar.

Separate the A/C condenser from the radiator by sliding from right to left.

- Remove the radiator.



12. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

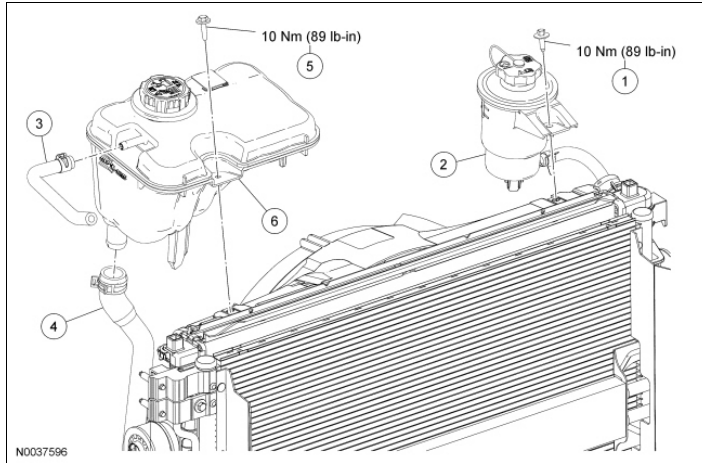
**NOTE:** Do not reuse hose clamps. Instead, use appropriately sized worm-style clamps in place of the constant tension clamps.

To install, reverse the removal procedure.

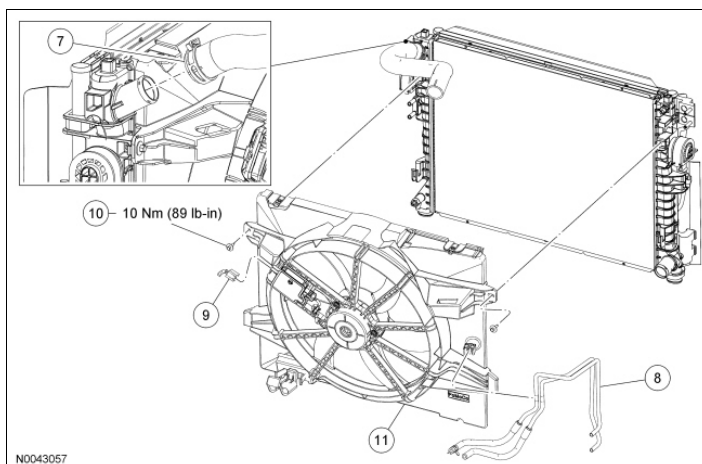
13. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding** in this section.

14. Fill the transmission to the correct fluid level. For additional information, refer to **Section 307-01** .



**Cooling Fan Motor and Shroud****Degas Bottle and Power Steering Reservoir**

Item	Part Number	Description
1	N606676	Power steering reservoir bolt
2	3531	Power steering reservoir
3	8W005	Degas bottle overflow hose
4	8B273	Degas bottle supply hose
5	W505424	Degas bottle bolt
6	8A080	Degas bottle

**Cooling Fan Motor and Shroud**

Item	Part Number	Description
7	8B274	Upper radiator hose
8	7T028	Transmission cooler tube
9	14A464	Cooling fan electrical connector

10	N606676	Cooling fan motor and shroud bolt (2 required)
11	8C607	Cooling fan motor and shroud

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

2. Remove the bolt and position aside the power steering reservoir.
  - To install, tighten to 10 Nm (89 lb-in).
3. Disconnect the degas bottle overflow hose and the supply hose and position aside.
4. Remove the bolt and the degas bottle.
  - To install, tighten to 10 Nm (89 lb-in).
5. Disconnect the upper radiator hose and position aside.
6. Detach the transmission cooler tubes from the cooling fan motor and shroud.
7. Disconnect the cooling fan motor and shroud electrical connector.
8. **NOTE:** Position the lower radiator hose away from the cooling fan motor and shroud.

Remove the 2 bolts and the cooling fan motor and shroud assembly.

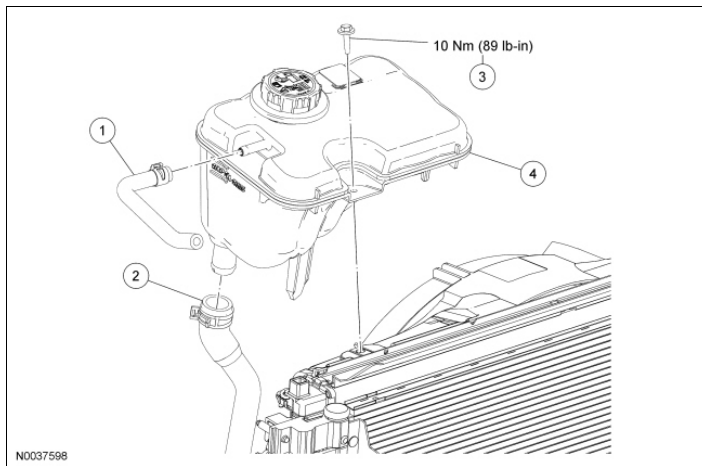
- To install, tighten to 10 Nm (89 lb-in).

9. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

10. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.



**Degas Bottle**

Item	Part Number	Description
1	8W005	Degas bottle overflow hose
2	8B273	Degas bottle supply hose
3	W505424	Degas bottle bolt
4	8A080	Degas bottle

**Removal and Installation**

1. **⚠ WARNING:** Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise. When the pressure is released, remove the pressure relief cap.

2. Using hose clamp pliers, clamp the degas bottle supply hose.
3. Using a suitable suction device, siphon the coolant from the degas bottle.
4. Disconnect the degas bottle overflow hose and supply hose.
5. Remove the bolt and the degas bottle.
  - To install, tighten to 10 Nm (89 lb-in).
6. **NOTE:** Do not reuse hose clamps. Instead, use appropriately sized worm-style clamps in place of the constant tension clamps.

To install, reverse the removal procedure.

7. Fill the degas bottle. For additional information, refer to Cooling System Draining, Filling and Bleeding for the recommended coolant mixture and fill level.





SECTION 303-04: Fuel Charging and Controls -  
4.6L (2V)  
SPECIFICATIONS

2010 Crown Victoria, Grand Marquis Workshop  
Manual

Procedure revision date: 08/19/2009

Material

Item	Specification	Fill Capacity
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	-

**Torque Specifications**

Description	Nm	lb-ft	lb-in
EGR system module tube fittings	43	32	-
Fuel Pump Driver Module (FPDM) bolts	4	-	35
Fuel rail bolts	10	-	89
Intake manifold crash bracket bolts	25	18	-
Intake manifold shield bolts	10	-	89
Throttle Body (TB) bolts <sup>a</sup>	-	-	-
TB spacer bolts	10	-	89

<sup>a</sup> Refer to the procedure in this section.

## **Fuel Charging and Controls**

The fuel charging and control system consists of the:

- Throttle Body (TB).
- fuel rail.
- fuel injectors.
- Fuel Pump Driver Module (FPDM).

The fuel charging and controls system is:

- a Sequential Multi-Port Fuel Injection (SFI).
- pulse-width modulated.
- Mass Air Flow (MAF) controlled.
- fuel rail pressure and temperature sensor.

### **Throttle Body (TB)**

The TB :

- controls air supply to the intake manifold by electronically positioning the throttle plate.
- is not adjustable.

### **Fuel Injectors**

The fuel injectors:

- are electrically operated by the PCM.
- atomize the fuel as the fuel is delivered.
- are deposit-resistant and self-cleaning.
- each have an internal solenoid which opens a needle valve to inject fuel into the lower intake manifold.

### **Fuel Rail**

The fuel rail:

- delivers fuel to the individual fuel injectors.
- receives fuel from the fuel supply tube.

### **Fuel Rail Pressure and Temperature Sensor**

The fuel rail pressure and temperature sensor:

- supplies the PCM with signals indicating fuel pressure and fuel temperature.

### **Fuel Pump Driver Module (FPDM)**

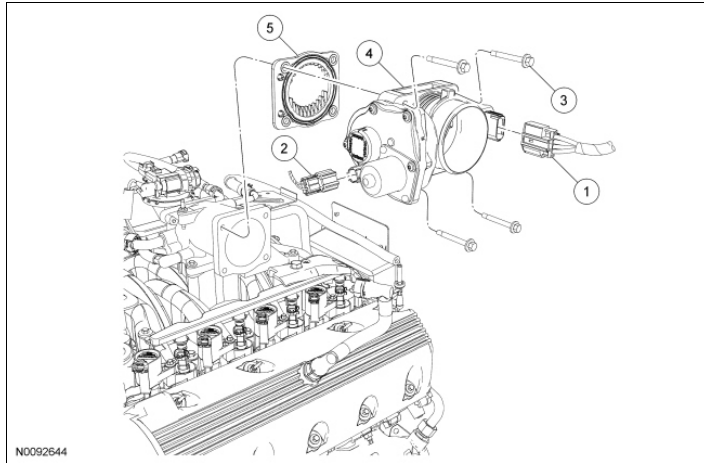
The FPDM :

- is electronically operated by the PCM.
  - controls voltage to the Fuel Pump (FP) module.
-

## **Fuel Charging and Controls**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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**Throttle Body**

Item	Part Number	Description
1	14A464	Throttle Position (TP) sensor electrical connector (part of 12B637)
2	14A464	Electronic throttle control electrical connector (part of 12B637)
3	W506102	Throttle Body (TB) bolt (4 required)
4	9F991	TB
5	9E930	TB gasket

**Removal**

1. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to [Section 303-12](#) .
2. Disconnect the electronic throttle control and the Throttle Position (TP) sensor electrical connectors.
3. Remove the 4 bolts and the Throttle Body (TB).
  - Discard the TB gasket.

**Installation**

1. Install a new gasket, the TB and the 4 bolts.
  - Tighten the bolts in 2 stages.
    - ◆ Stage 1: Tighten to 9 Nm (80 lb-in).
    - ◆ Stage 2: Rotate an additional 90 degrees.
2. Connect the electronic throttle control and the TP sensor electrical connectors.
3. Install the ACL outlet pipe. For additional information, refer to [Section 303-12](#) .

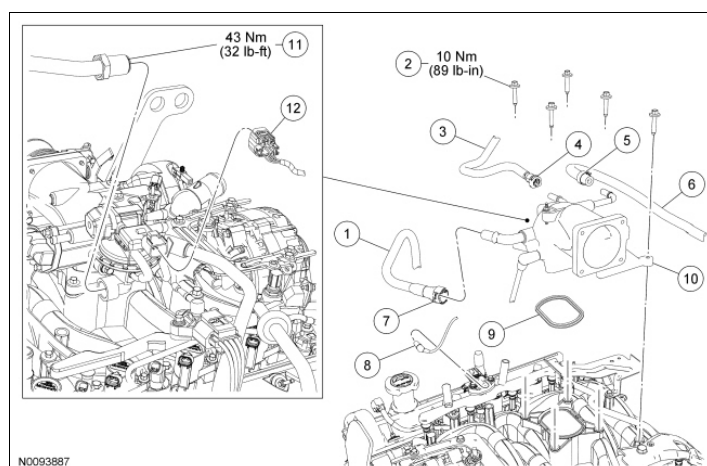


## SECTION 303-04: Fuel Charging and Controls - 4.6L (2V)

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## REMOVAL AND INSTALLATION

Procedure revision date: 08/19/2009

**Throttle Body - Spacer**

Item	Part Number	Description
1	6K817	Crankcase ventilation tube
2	N906154	Throttle Body (TB) spacer bolt (5 required)
3	6K817	Evaporative Emission (EVAP) vapor tube
4	-	EVAP vapor tube-to- TB spacer quick connect coupling (part of 6K817)
5	-	Brake booster vacuum hose clamp (part of 9C490)
6	2365	Brake booster-to- TB spacer vacuum hose
7	-	Crankcase ventilation tube-to- TB spacer quick connect coupling (part of 6K817)
8	9E498	Fuel rail pressure and temperature sensor vacuum hose fitting
9	9L437	TB spacer seal
10	9A589	TB spacer
11	-	EGR system module tube-to-EGR system module fitting (part of 9D477)
12	14A464	EGR system module electrical connector

**Removal and Installation**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always



**present and may be ignited. Failure to follow these instructions may result in serious personal injury.**

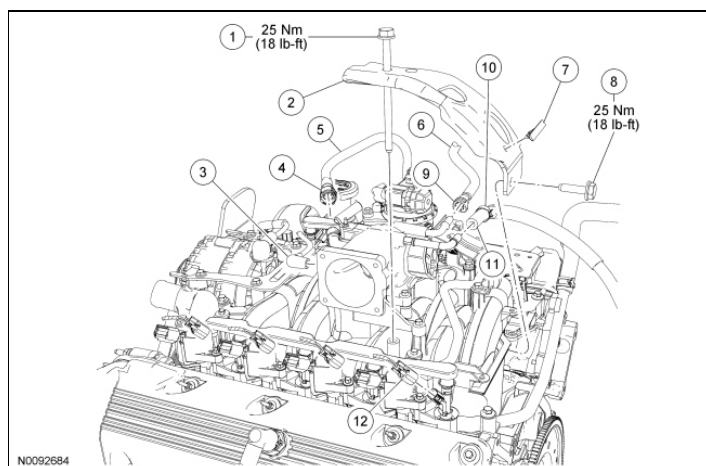
1. Remove the Throttle Body (TB). For additional information, refer to Throttle Body in this section.
  2. Release the clamp and remove the brake booster-to- TB spacer vacuum hose.
  3. Disconnect the crankcase ventilation tube-to- TB spacer quick connect coupling. For additional information, refer to Section 310-00 .
  4. Disconnect the Evaporative Emission (EVAP) vapor tube-to TB spacer quick connect coupling. For additional information, refer to Section 310-00 .
  5. Disconnect the EGR system module electrical connector.
  6. Disconnect the fuel rail pressure and temperature sensor vacuum hose fitting.
  7. Disconnect the EGR system module tube-to-EGR system module fitting.
    - To install, tighten to 43 Nm (32 lb-ft).
  8. Remove the 5 bolts and the TB spacer.
    - To install, tighten to 10 Nm (89 lb-in).
  9. To install, reverse the removal procedure.
    - Inspect the TB spacer seal.
-

## SECTION 303-04: Fuel Charging and Controls - 4.6L (2V)

2010 Crown Victoria, Grand Marquis  
Workshop Manual

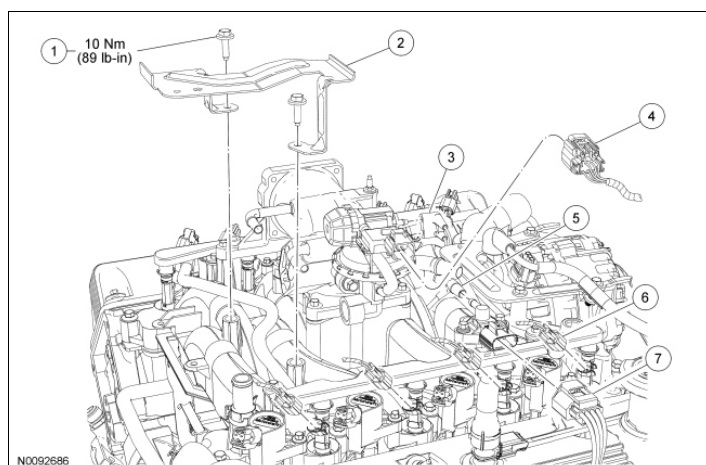
## REMOVAL AND INSTALLATION

Procedure revision date: 08/19/2009

**Fuel Rail and Fuel Injector - Exploded View****Intake Manifold Bracket, Hoses and Electrical Connectors**

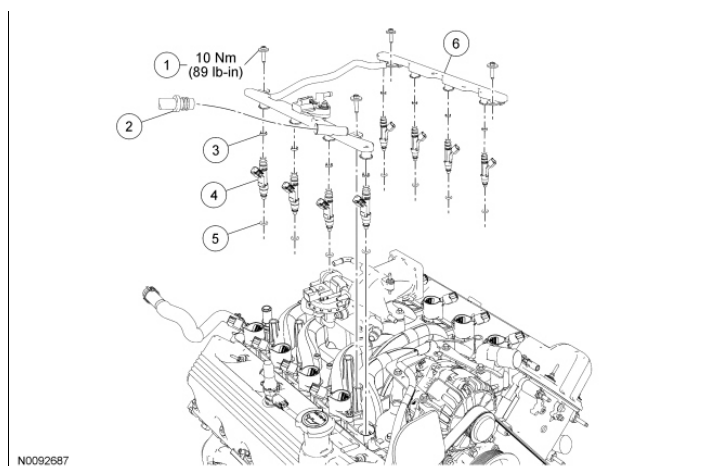
Item	Part Number	Description
1	W705793	Intake manifold crash bracket bolt
2	9G609	Intake manifold crash bracket
3	9E499	Intake manifold vacuum hose
4	-	Crankcase ventilation tube-to-Throttle Body (TB) spacer quick connect coupling (part of 6K817)
5	6K817	Crankcase ventilation tube
6	9D289	Evaporative Emission (EVAP) vapor tube
7	13A506	Wire harness retainer (if equipped)
8	W701725	Intake manifold crash bracket bolt
9	-	EVAP vapor tube-to- TB spacer quick connect coupling
10	-	Brake booster vacuum hose clamp (part of 2365)
11	2365	Brake booster vacuum hose
12	14A464	LH fuel injector electrical connector (4 required)

**Intake Manifold Shield, Hoses and Electrical Connectors**



Item	Part Number	Description
1	N807309	Intake manifold shield bolt (2 required)
2	9F460	Intake manifold shield
3	9E489	EGR module vacuum connector
4	14A464	EGR module electrical connector
5	9E489	Fuel rail pressure and temperature sensor vacuum hose
6	14A464	RH fuel injector electrical connector (4 required)
7	14A464	Fuel rail pressure and temperature sensor electrical connector

### Fuel Rail and Injectors



Item	Part Number	Description
1	N804394	Fuel rail bolt (4 required)
2	-	Fuel tube-to-fuel rail spring lock coupling (part of 9G271)
3	9229	Fuel injector upper O-ring seal (8 required)
4	9F593	Fuel injector (8 required)
5	9229	Fuel injector lower O-ring seal (8 required)

6	9F792	Fuel rail
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1. For additional information, refer to the procedures in this section.
-

**Fuel Rail**

## Material

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Removal and Installation**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Clean all fuel residue from the engine compartment. If not removed, fuel residue may ignite when the engine is returned to operation. Failure to follow this instruction may result in serious personal injury.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .


2. Release the fuel system pressure. For additional information, refer to [Section 310-00](#) .
3. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
4. Disconnect the fuel supply tube-to-fuel rail spring lock coupling. For additional information, refer to [Section 310-00](#) .
5. Remove the Throttle Body (TB). For additional information, refer to [Throttle Body](#) in this section.
6. Remove the EGR system module tube. For additional information, refer to [Section 303-08](#) .

7. Release the clamp and disconnect the brake booster vacuum hose from the TB spacer.
8. Disconnect the Evaporative Emission (EVAP) vapor tube-to- TB spacer quick connect coupling. For additional information, refer to Section 310-00 .
9. Disconnect the crankcase ventilation tube-to- TB spacer quick connect coupling. For additional information, refer to Section 310-00 .
10. Disconnect the intake manifold vacuum hose from the TB spacer.
11. If equipped, release the wire harness retainer from the crash bracket.
12. Remove the 2 bolts and the crash bracket.
  - To install, tighten to 25 Nm (18 lb-ft).
13. Disconnect the 8 fuel injector electrical connectors.
14. Disconnect the fuel rail pressure and temperature sensor vacuum hose and electrical connector.
15. Disconnect the EGR module vacuum and electrical connectors.
16. Remove the 2 bolts and the intake manifold shield.
  - To install, tighten to 10 Nm (89 lb-in).
17. Remove the 4 fuel rail bolts.
  - To install, tighten to 10 Nm (89 lb-in).
18. Remove the fuel rail and fuel injectors as an assembly.
19. **NOTICE: O-ring seals are made of special fuel-resistant material. Fuel will damage ordinary O-ring seals, and may cause the fuel system to leak.**

**NOTICE: Do not reuse O-ring seals. The removal and installation process may damage the used O-ring seals, and may cause the fuel system to leak.**

Remove the fuel injectors and O-ring seals.

- Discard the O-ring seals.

20.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Install new upper and lower fuel injector O-ring seals and lubricate with clean engine oil prior to installation.

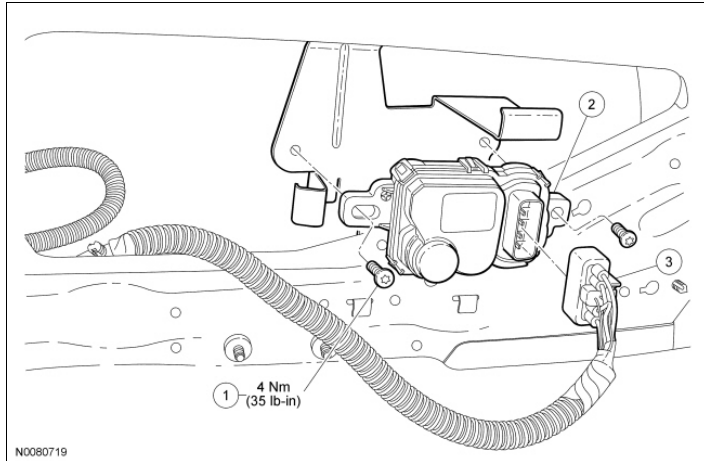


## **Fuel Injectors**

### **Removal and Installation**

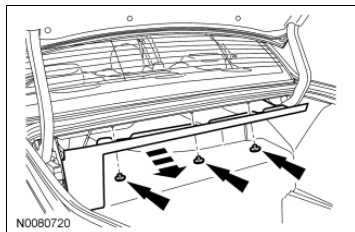
1. The fuel injectors are serviced with the fuel rail. For additional information, refer to Fuel Rail and Fuel Injector - Exploded View and Fuel Rail in this section.
-



**Fuel Pump Driver Module (FPDM)****Removal and Installation**

Item	Part Number	Description
1	W504755	Fuel Pump Driver Module (FPDM) bolt (2 required)
2	9D372	FPDM
3	14A464	FPDM electrical connector

1. Remove the 3 pin-type retainers and the luggage compartment parcel shelf trim panel.



2. Disconnect the Fuel Pump Driver Module (FPDM) electrical connector.
3. Remove the 2 bolts and the FPDM .
  - To install, tighten to 4 Nm (35 lb-in).
4. To install, reverse the removal procedure.



**General Specifications**

Item	Specification
Belt tension	Automatic tensioner (non-adjustable)
Drive belt specification	6 rib

**Torque Specifications**

Description	Nm	lb-ft
Belt idler pulley bolt	25	18
Drive belt tensioner bolt <sup>a</sup>	-	-

<sup>a</sup> Refer to the procedure in this section.

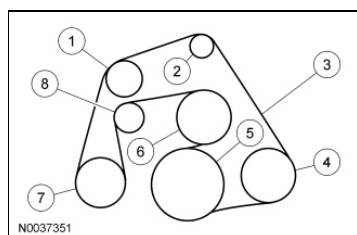
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**Accessory Drive**

The accessory drive system:

- has a single serpentine accessory drive belt with 6 ribs.
- has an idler pulley.
- has an automatic drive belt tensioner.
- is not adjustable.

The accessory drive system provides power to operate components which power other systems. These could include components such as the generator, power steering pump and A/C compressor. Each of these components is equipped with a pulley which is driven by the accessory drive belt. The accessory drive belt is driven by the engine crankshaft pulley. One or more idler pulleys may be provided to facilitate belt routing and alignment. The automatic belt tensioner maintains correct belt tension and compensates for component wear and changes in system load. System load changes can be caused by the A/C compressor clutch engaging or disengaging, or demand changes on other systems powered by the accessory drive belt. To maintain correct operation of this system, it is critical that the correct length drive belt be installed. The pulleys must also be correctly aligned and kept clean.

**Accessory Drive Belt Routing**

Item	Part Number	Description
1	8678	Accessory drive belt idler pulley
2	10344	Generator pulley
3	8620	Accessory drive belt
4	3A733	Power steering pump pulley
5	6312	Crankshaft pulley
6	8509	Coolant pump pulley
7	2E884	A/C clutch pulley
8	6B209	Accessory drive belt tensioner pulley

**Belt Tensioner**

Automatic tensioners are calibrated to provide the correct amount of tension to the belt for a given accessory drive system. Unless a spring or damping band within the tensioner assembly breaks, or some other mechanical part of the tensioner fails, there is no need to check the tensioner for correct tension.



---

## Accessory Drive

### Inspection and Verification

**NOTICE:** Under no circumstances should the accessory drive belt, tensioner or pulleys have any fluids or belt dressing applied to them as damage to the belt material and tensioner damping mechanism may occur.

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of mechanical damage.

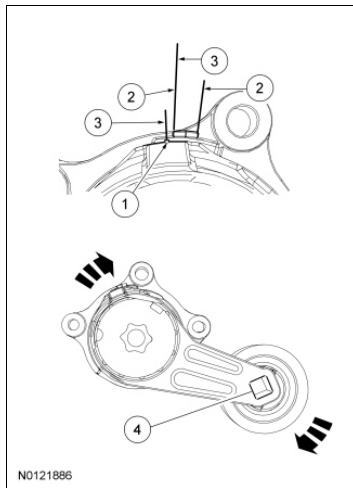
### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"><li>• Drive belt cracking/chunking/wear</li><li>• Belt/pulley contamination</li><li>• Incorrect accessory drive belt</li><li>• Incorrectly routed accessory drive belt</li><li>• Pulley misalignment or excessive pulley runout</li><li>• Loose or mislocated hardware</li><li>• Incorrectly routed power steering tubes (rubbing)</li><li>• Loose accessory drive belt</li><li>• Damaged pulleys</li><li>• Tensioner arm misalignment</li></ul>

### Belt Tensioner With Belt Length Indicator

**NOTE:** Belt tensioner is shown in the free-state position against the arm travel stops.

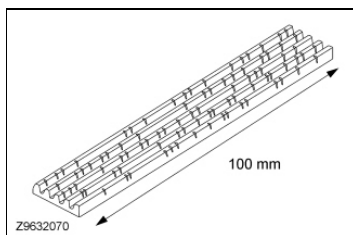
**NOTE:** 6.2L engine accessory drive belt tensioner shown, other accessory drive belt tensioners similar.



Item	Description
1	Belt length indicator
2	Acceptable belt installation and wear range
3	Belt replacement range
4	Belt tension relief point

3. Check that the belt length indicator, if equipped, on the belt tensioner is in the acceptable belt installation and wear range. If the indicator is in the belt replacement range, either an incorrect belt is installed or the belt is worn beyond the service limit. Install a new belt as necessary.
4. Eliminate all other non-belt related noises that could cause belt misdiagnosis, such as A/C compressor engagement chirp, A/C slugging noise, power steering cavitations at low temperatures, Variable Camshaft Timing (VCT) tick or generator whine.
5. If a concern is found, correct the condition before proceeding to the next step.

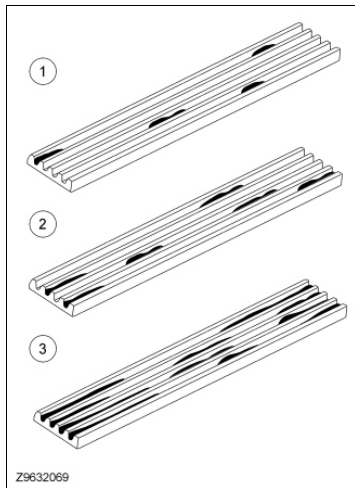
#### V-Ribbed Serpentine Drive Belt With Cracks Across Ribs



6. Check the belt for cracks. Up to 15 cracks in a rib over a distance of 100 mm (4.0 in) can be considered acceptable. If cracks exceed this standard, install a new belt.

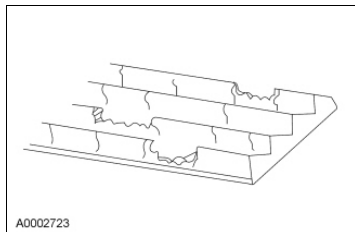
#### V-Ribbed Serpentine Belt With Piling

**NOTE:** Piling is an excessive buildup in the V-grooves of the belt.



7. The condition of the V-ribbed drive belt should be compared against the illustration and appropriate action taken.
1. Small scattered deposits of rubber material. This is not a concern, therefore, installation of a new belt is not required.
  2. Longer deposit areas building up to 50% of the rib height. This is not considered a durability concern, but it can result in excessive noise. If noise is apparent, install a new belt.
  3. Heavy deposits building up along the grooves resulting in a possible noise and belt stability concern. If heavy deposits are apparent, install a new belt.

#### V-Ribbed Serpentine Belt With Chunks of Rib Missing



8. There should be no chunks missing from the belt ribs. If the belt shows any evidence of this, install a new accessory drive belt.
9. If the concern is not visually evident, verify the symptom and GO to [Symptom Chart](#) .

#### Symptom Chart

Symptom Chart

#### Component Tests

#### Drive Belt - Noise/Flutter

**NOTICE:** Under no circumstances should the accessory drive belt, tensioner or pulleys have any fluids or belt dressing applied to them as damage to the belt material and tensioner damping mechanism may occur.



Drive belt chirp occurs due to pulley misalignment or excessive pulley runout. It can be the result of a damaged or incorrectly aligned grooved pulley.

To correct, determine the area where the noise comes from. Check each of the pulleys in that area with a straightedge to the crankshaft pulley. Look for accessory pulleys out of position in the fore/aft direction or at an angle to the straightedge.

Drive belt squeal may be an intermittent or constant noise that occurs when the drive belt slips on an accessory pulley under certain conditions.

A short intermittent squeal may occur during engine start up and shut down or during very rapid engine acceleration and decelerations, such as:

- Wide Open Throttle (WOT) 1-2 and 2-3 shifts or 2-3 and 3-4 back-out shifts on automatic transmissions.
- WOT 1-2 and 2-3 shifts and any combination of rapid downshifting on manual transmissions.

These special short-term transient events are expected, and are due to the higher system inertias required to meet the electrical and cooling demands on today's vehicle systems. Constant or reoccurring drive belt squeal can occur:

- if the A/C discharge pressure goes above specifications:
  - ◆ the A/C system is overcharged.
  - ◆ the A/C condenser core airflow is blocked.
  - ◆ the A/C anti-slugging strategy executes after a long hot heat soak.
- if the A/C off equalized pressure (the common discharged and suction pressure that occurs after several minutes) exceeds specifications.
- if any of the accessories or idler pulley(s) are damaged or have a worn or damaged bearing. All accessories should be rotatable by hand in the unloaded condition. If not, inspect the accessory.
- if there is evidence of fluid contamination on the accessory drive belt. When the drive belt has been exposed to fluid contamination during vehicle operation, such as leaks from the power steering system, A/C system or cooling system, clean all pulleys with soap and water, rinse with clean water and install a new accessory drive belt. If the drive belt has been exposed to fluids in a localized area during routine vehicle service, such as replacement of hoses or fluids, the drive belt and pulleys should be washed with soap and water immediately (prior to starting the engine), and rinsed with clean water.
- if the accessory drive belt is too long. A drive belt that is too long will allow the accessory drive belt tensioner arm to go all the way to the arm travel stop under certain load conditions, which will release tension to the drive belt. If the accessory drive belt tensioner indicator is outside the normal installation wear range window, install a new accessory drive belt.
- **NOTE:** The accessory drive belt tensioner arm should rotate freely without binding.

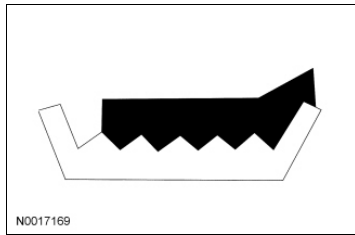
Install a new accessory drive belt tensioner if the drive belt tensioner is worn or damaged.

### Drive Belt - Incorrect Installation

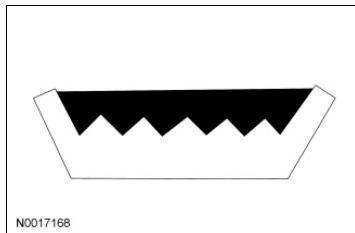
**NOTICE:** Incorrect accessory drive belt installation will cause excessive drive belt wear and may cause the drive belt to come off the pulleys.

Non-standard accessory drive belts can track differently or incorrectly. If an accessory drive belt tracks incorrectly, install a new accessory drive belt to avoid performance failure or loss of the drive belt.

### Incorrect Installation



### Correct Installation



With the engine running, check accessory drive belt tracking on all pulleys. If the edge of the accessory drive belt rides beyond the edge of the pulleys, noise and premature wear will occur. Make sure the accessory drive belt rides correctly on the pulley. If an accessory drive belt tracking condition exists, proceed with the following:

- Visually check the accessory drive belt tensioner for damage and wear, especially the mounting pad surface and arm alignment. If the accessory drive belt tensioner is not installed correctly, the mounting surface pad will be out of position. If the tensioner arm is worn, the arm will be out of alignment. Either of these conditions will result in chirp and squeal noises.
- With the engine running, visually observe the grooves in the pulleys (not the pulley flanges or the pulley forward faces) for excessive wobble. Install new components as necessary.
- Check all accessories, mounting brackets and the accessory drive belt tensioner for any interference that would prevent the component from mounting correctly. Correct any interference condition and recheck the accessory drive belt tracking.
- Tighten all accessories, mounting brackets and accessory drive belt tensioner retaining hardware to specification. Recheck the accessory drive belt tracking.

### Belt Tensioner - Mechanical

The only mechanical check that needs to be made is a check for tensioner stick, grab or bind.

1. With the engine off, check routing of the accessory drive belt. Refer to the illustrations under Accessory Drive in the Description and Operation portion of this section.
2. **NOTE:** The accessory drive belt tensioner spring is very strong and requires substantial force to release.

Release the tension on the belt and detach the accessory drive belt from the tensioner. Carry out the following tests:

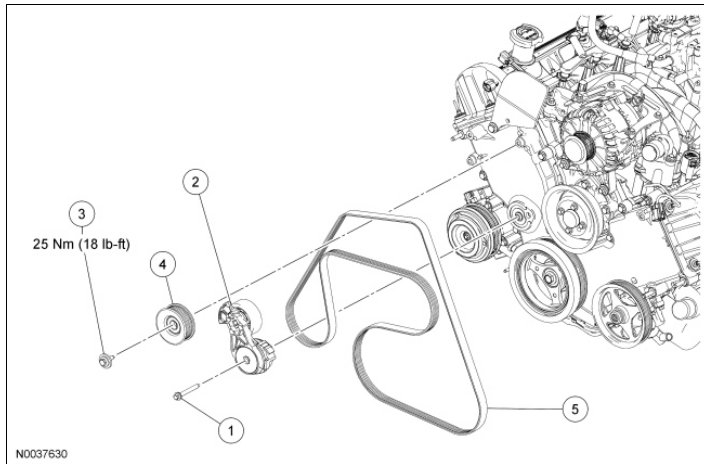
- Move the tensioner from its relaxed position, through its full stroke and back to the relaxed position to make sure there is no stick, grab or bind, and to make sure that there is tension on the tensioner spring.

- Rotate the tensioner pulley by hand and check for a binding, contaminated or seized condition.
  - Inspect the area surrounding the accessory drive belt tensioner for oil leaks or contamination and repair any leaks.
3. If the accessory drive belt tensioner does not meet the criteria in the previous step, install a new tensioner. If the accessory drive belt tensioner meets the criteria in the previous step, proceed to testing the tensioner dynamically.
  4. If the tensioner is saturated with oil and grease internally, install a new tensioner.

### **Belt Tensioner - Dynamics**

The accessory drive belt tensioner can be checked dynamically as follows:

1. With the engine running, observe the accessory drive belt tensioner movement. The accessory drive tensioner should move (respond) when the A/C clutch cycles (if equipped), or when the engine is accelerated rapidly. If the accessory drive belt tensioner movement is excessive without A/C clutch cycling or engine acceleration, check belt rideout. Excessive belt rideout (uneven depth of grooves in the belt) can cause excessive accessory drive belt tensioner movement. Check rideout condition by installing a new belt. If excessive accessory drive belt tensioner movement still exists, install a new accessory drive belt tensioner.
-

**Front End Accessory Drive (FEAD) - Exploded View**

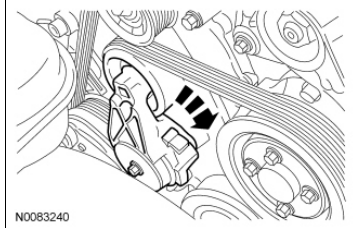
Item	Part Number	Description
1	W705738	Accessory drive belt tensioner bolt
2	6B209	Accessory drive belt tensioner
3	N808102	Accessory drive belt idler pulley bolt
4	8678	Accessory drive belt idler pulley
5	8620	Accessory drive belt

1. For additional information, refer to the procedures in this section.

## Accessory Drive Belt

### Removal and Installation

1. Rotate the tensioner clockwise and remove the accessory drive belt.

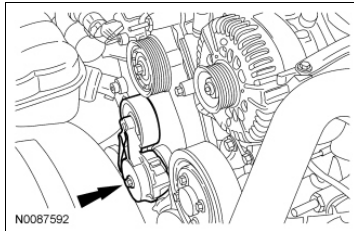


2. To install, reverse the removal procedure.
    - Refer to Description and Operation in this section for drive belt routing.
-

## Accessory Drive Belt Tensioner

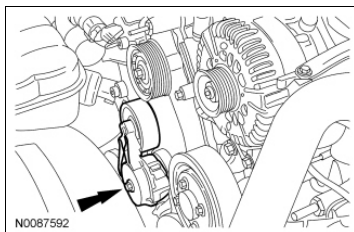
### Removal

1. Remove the accessory drive belt. For additional information, refer to [Accessory Drive Belt](#) in this section.
2. Remove the bolt and the accessory drive belt tensioner.



### Installation

1. Install the accessory drive belt tensioner.  
Tighten the bolt in 2 stages:
  - Stage 1: Tighten to 10 Nm (89 lb-in).
  - Stage 2: Tighten an additional 90 degrees.



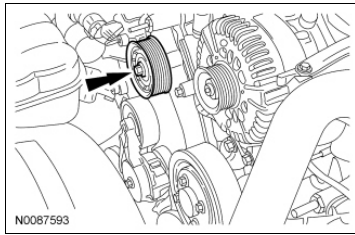
2. Install the accessory drive belt. For additional information, refer to [Accessory Drive Belt](#) in this section.
-



## Accessory Drive Belt Idler Pulley

### Removal and Installation

1. Remove the accessory drive belt. For additional information, refer to [Accessory Drive Belt](#) in this section.
2. Remove the bolt and the accessory drive belt idler pulley.
  - To install, tighten to 25 Nm (18 lb-ft).



3. To install, reverse the removal procedure.
-



**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Starter motor bolts	25	18	-
Starter solenoid B-terminal nut	12	-	106
Starter solenoid S-terminal nut	6	-	53

---

## Starting System

The starting system consists of the:

- starter motor.
- ignition switch.
- digital Transmission Range (TR) sensor.
- mini ISO relay.

### Starting System - Starter Motor

The starter motor:

- is a permanent-magnet, gear reduction, 12V DC motor.
- has an integral starter solenoid.

### Starting System - Starter Relay

The starter relay:

- is a mini ISO relay.
- switches power to the starter solenoid to engage the starter motor when it receives a START signal from the ignition switch.

### Starting System - Normal Operation




When the starter solenoid is energized, a magnetic field is created in the starter solenoid windings. The iron plunger core is drawn into the starter solenoid coil, and a drive lever and pin connected to the starter drive engages the drive pinion gear to the flywheel ring gear. When the plunger is pulled all the way in, its contact disc closes the circuit between the battery and the motor feed terminals. This sends current to the motor, and the drive pinion gear cranks the flexplate to start the engine. When current flows to the starter motor, the starter solenoid pull-in coil is bypassed, and the hold-in coil keeps the drive pinion gear engaged with the flywheel.

The starting system uses a digital TR sensor that recognizes the vehicle is in either PARK or NEUTRAL and the ignition switch is placed in the START position. It sends a signal to the mini ISO relay that, in turn, sends a voltage signal to the starter solenoid, which will engage the starter motor to crank the engine at a speed fast enough to permit the engine to start.

---



**Starting System****Special Tool(s)**

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation**

When the ignition switch is turned to the START position and the vehicle is in the NEUTRAL or PARK position, the starter relay switches power to the starter solenoid causing the starter motor to engage, turning the engine at a speed fast enough to permit the engine to start.

**Starting System - Anti-Theft Intervention**

The starting system is electronically controlled by the Passive Anti-Theft System (PATS). PATS is controlled by the PCM. PATS recognizes the correct electronically coded ignition key and signals the PCM to provide a ground for the starter relay. The energized relay provides voltage to the starter solenoid, thereby allowing the starter motor to activate.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery before disconnecting the starter motor battery terminal lead. If a tool is shorted at the starter motor battery terminal, the tool can quickly heat enough to cause a skin burn. Failure to follow this instruction may result in serious personal injury.

**NOTE:** When working on the starter system, make sure the anti-theft system is operational.

1. Verify the customer concern by operating the starting system.
2. Visually inspect for obvious signs of mechanical and electrical damage. Refer to the following chart.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Starter motor</li> <li>• Starter solenoid</li> <li>• Flexplate</li> </ul>	<ul style="list-style-type: none"> <li>• Battery</li> <li>• Battery Junction Box (BJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 105 (30A)</li> <li>◆ 1 (30A)</li> <li>◆ 6 (15A)</li> </ul> </li> <li>• Central Junction Box (CJB) fuse 1 (10A)</li> <li>• Damaged wiring harness</li> <li>• Loose or corroded connections</li> <li>• Starter relay</li> <li>• Anti-theft system</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- verify the ignition key is in the ON position.
- verify the scan tool operation with a known good vehicle.
- refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the continuous DTCs and carry out the self-test diagnostics for the instrument cluster and PCM.

9. If the DTCs retrieved are related to the concern, go to PCM DTC Chart. For all other DTCs, refer to Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

**DTC Charts**

**PCM DTC Chart**

<b>DTC</b>	<b>Description</b>	<b>Action</b>
P0705	Digital Transmission Range (TR) sensor circuit failure	Refer to the appropriate section in Group <a href="#">307</a> for the procedure.
P0708	Digital TR sensor circuit open	Refer to the appropriate section in Group <a href="#">307</a> for the procedure.
P1260	Theft Detected, Vehicle Immobilized	REFER to the DTC Chart in <a href="#">Section 419-01</a> .
P1702	Intermittent DTC P0705 or P0708	Refer to the appropriate section in Group <a href="#">307</a> for the procedure.
P1704	Digital TR circuit reading in between gear position during KOEO / KOER	Refer to the appropriate section in Group <a href="#">307</a> for the procedure.
P1705	Digital TR self test was not carried out in PARK or NEUTRAL	Refer to the appropriate section in Group <a href="#">307</a> for the procedure.

**Symptom Chart**

Symptom Chart

**Pinpoint Tests****Pinpoint Test A: The Engine Does Not Crank**

Refer to Wiring Diagrams Cell [20](#) , Starting System for schematic and connector information.

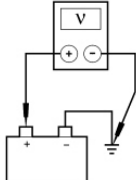
**Normal Operation**

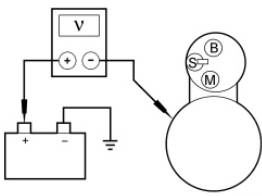
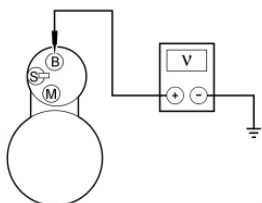
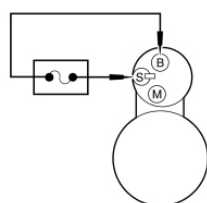
Under normal operation, the Battery Junction Box (BJB) supplies constant power to the starter relay on circuit 32 (RD/LB) through fuse 105 (30A). When the key is placed in the START position with the vehicle in PARK or NEUTRAL, the digital Transmission Range (TR) sensor provides power on circuit 33 (WH/PK) and the PCM provides ground on circuit 3405 (GY/RD), activating the starter motor. On police vehicles, the digital TR sensor provides power on circuit 33 (WH/PK) and ground through circuit 57 (BK), activating the starter motor. This allows power to be supplied from the starter motor relay contacts which then flows through circuit 113 (YE/LB) to the starter solenoid. The solenoid is grounded at the starter motor. Energizing the starter solenoid will engage the starter drive into the ring gear and close the solenoid contacts, allowing power directly from the battery through circuit 2037 (RD) to the starter motor to start the engine.

**This pinpoint test is intended to diagnose the following:**

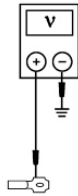
- Battery
- Starter motor
- Starter motor solenoid relay
- Starter motor relay
- Ignition switch
- PCM
- Fuse
- Anti-theft system
- Circuitry

## PINPOINT TEST A: THE ENGINE DOES NOT CRANK

Test Step	Result / Action to Take
<b>A1 CHECK THE BATTERY</b>	
<ul style="list-style-type: none"> <li>Check the battery condition and state of charge. Refer to Diagnosis and Testing in <u>Section 414-01</u> .</li> <li><b>Is the battery OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> CHARGE or INSTALL a new battery as necessary. REFER to <u>Section 414-01</u> . TEST the system for normal operation.</p>
<b>A2 CHECK FOR PATS OR PCM DTCs</b>	
<ul style="list-style-type: none"> <li>Using the DTCs retrieved in Inspection and Verification, check for Passive Anti-Theft System (PATS) and PCM DTCs.</li> <li><b>Were any PATS or PCM DTCs retrieved?</b></li> </ul>	<p><b>Yes</b> REFER to the DTC Chart in <u>Section 419-10</u> .</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 CHECK THE BATTERY GROUND CABLE</b>	
<ul style="list-style-type: none"> <li><b>⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</b></li> <li>With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>Measure the voltage between the positive battery post and the battery ground cable connection at the cylinder block.</li> </ul>  <p style="text-align: center;">AJ0280-A</p> <ul style="list-style-type: none"> <li><b>Is the voltage reading greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> INSTALL a new battery ground cable. REFER to <u>Section 414-01</u> . TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A21</u> .</p>
<b>A4 CHECK THE STARTER MOTOR GROUND</b>	
<ul style="list-style-type: none"> <li>Measure the voltage between the battery positive post and the starter motor case.</li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> CLEAN the starter motor mounting flange and make sure the starter motor is correctly mounted. TEST the system for normal operation. If equipped with</p>

 <p>AJ0281-A</p> <ul style="list-style-type: none"> <li>• Is the voltage reading greater than 10 volts?</li> </ul>	<p>a fire suppression system, GO to <a href="#">A21</a> .</p>
<p><b>A5 CHECK THE POWER SUPPLY AT THE STARTER MOTOR</b></p>	
<ul style="list-style-type: none"> <li>• Measure the voltage at starter motor solenoid C197A, circuit 2037 (RD) and ground.</li> </ul>  <p>AJ0278-A</p> <ul style="list-style-type: none"> <li>• Is the voltage reading greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A6</a> .</p> <p><b>No</b> INSTALL a new positive battery cable. REFER to <a href="#">Section 414-01</a> . TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p>
<p><b>A6 CHECK THE STARTER MOTOR</b></p>	
<ul style="list-style-type: none"> <li>• Connect one end of a fused jumper wire to starter motor C197A, circuit 2037 (RD). Momentarily connect the other end of the jumper to starter motor C197B, circuit 113 (YE/LB).</li> </ul>  <p>N0087623</p> <ul style="list-style-type: none"> <li>• Does the starter motor engage and the engine crank?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A7</a> .</p> <p><b>No</b> INSTALL a new starter motor. REFER to <a href="#">Starter Motor</a> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p>
<p><b>A7 CHECK START INPUT TO THE STARTER MOTOR</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Starter Motor Solenoid C197B.</li> <li>• Measure the voltage at the starter motor solenoid C197B, circuit 113 (YE/LB) and ground, while holding the ignition switch to the START position.</li> </ul>	<p><b>Yes</b> CLEAN the starter motor solenoid C197B stud and connector. CHECK the wiring and the starter motor for a loose or intermittent connection. TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p> <p><b>No</b> GO to <a href="#">A8</a> .</p>





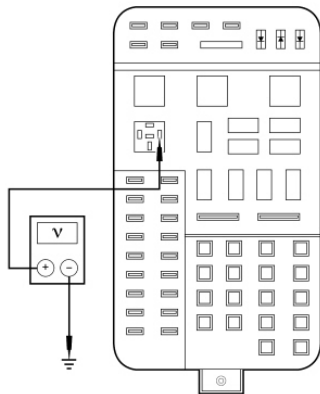
AJ0285-A

- Is the voltage reading greater than 10 volts?

**A8 CHECK START INPUT TO THE STARTER RELAY**

**NOTICE:** Use the correct probe adapter(s) when taking measurements. Failure to use the correct probe adapter(s) may damage the connector.

- Ignition OFF.
- Disconnect: BJB Starter Relay.
- Measure the voltage at the BJB starter relay pin 86, circuit 33 (WH/PK), while holding the ignition switch to the START position.



N0058177

- Is the voltage reading greater than 10 volts?

**A9 CHECK THE BATTERY SUPPLY TO THE STARTER RELAY**

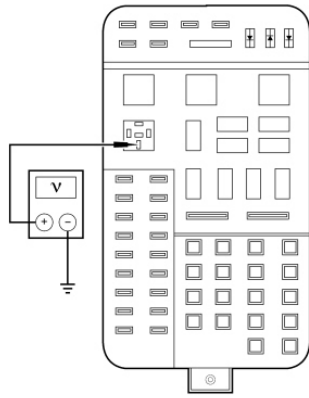
- Ignition OFF.
- Measure the voltage at the BJB starter relay pin 30, circuit 32 (RD/LB) and ground.

**Yes**GO to A9.**No**GO to A15.**Yes**

For police vehicles, GO to A10. For all other vehicles, GO to A11.

**No**

VERIFY BJB fuse 105 (30 A) is OK. If OK, REPAIR the circuit 32 (RD/LB). TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. If equipped with a fire suppression system, GO to A21.

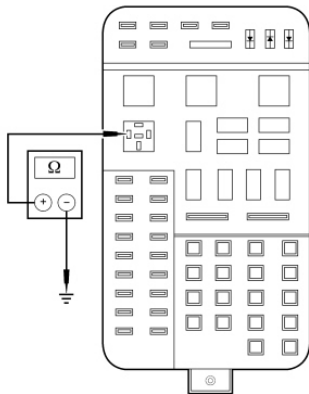


N0047485

- Is the voltage reading greater than 10 volts?

#### A10 CHECK THE STARTER RELAY GROUND

- On police vehicles, measure the resistance between BJB starter relay pin 85, circuit 57 (BK) and ground.



N0058178

- Is the resistance reading less than 5 ohms?

#### A11 CHECK CIRCUIT 3405 (GY/RD) FOR AN OPEN

- Disconnect: PCM C175B.
- Measure the resistance between BJB starter relay pin 85, circuit 3405 (GY/RD) and PCM C175B-2, circuit 3405 (GY/RD), harness side.

**Yes**

GO to A12 .

**No**

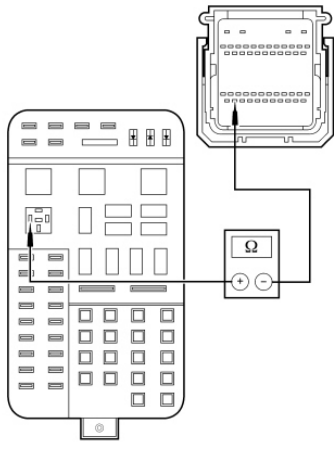
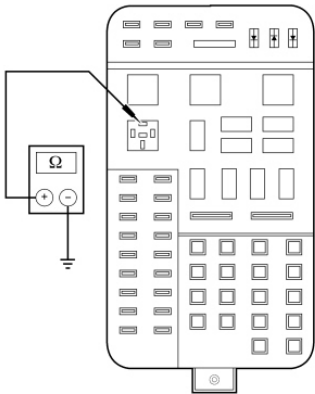
REPAIR circuit 57 (BK) for an open. TEST the system for normal operation. If equipped with a fire suppression system, GO to A21 .

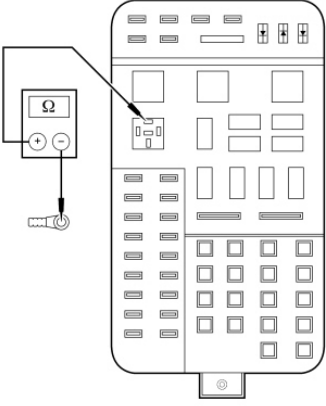
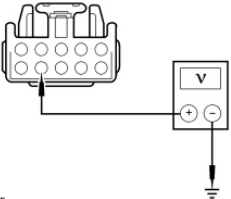
**Yes**

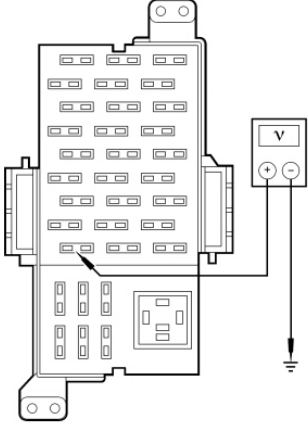
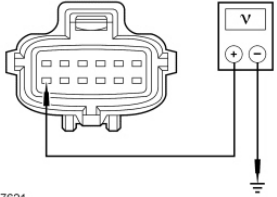
GO to A12 .

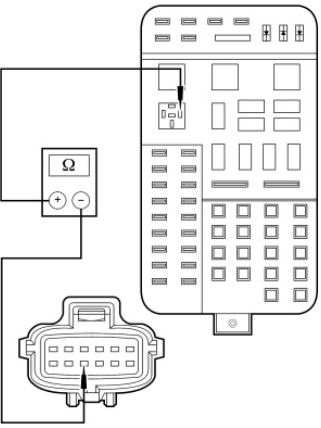
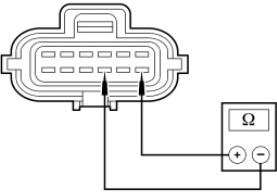
**No**

REPAIR circuit 3405 (GY/RD). TEST the system for normal operation. If equipped with a fire suppression system, GO to A21 .

 <p>N0058176</p> <ul style="list-style-type: none"> <li>• Is the resistance reading less than 5 ohms?</li> </ul>	
<p><b>A12 CHECK CIRCUIT 113 (YE/LB) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Starter Motor Solenoid 197B.</li> <li>• Measure the resistance between BJB starter relay pin 87, circuit 113 (YE/LB) and ground.</li> </ul>  <p>N0047488</p> <ul style="list-style-type: none"> <li>• Is the resistance reading less than 10,000 ohms?</li> </ul>	<p><b>Yes</b> REPAIR circuit 113 (YE/LB) for a short to ground. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A21</u> .</p> <p><b>No</b> GO to <u>A13</u> .</p>
<p><b>A13 CHECK CIRCUIT 113 (YE/LB) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between BJB starter relay pin 87, circuit 113 (YE/LB) and starter motor solenoid C197B, circuit 113 (YE/LB).</li> </ul>	<p><b>Yes</b> GO to <u>A14</u> .</p> <p><b>No</b> REPAIR circuit 113 (YE/LB) for an open. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A21</u> .</p>

 <p>N0047489</p> <ul style="list-style-type: none"> <li>• Is the resistance reading less than 5 ohms?</li> </ul>	
<b>A14 CHECK THE STARTER MOTOR RELAY</b>	
<ul style="list-style-type: none"> <li>• Carry out the Starter Motor Relay Component Test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• Did the starter motor relay pass the component test?</li> </ul>	<p><b>Yes</b> INSTALL a new BJB . TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A21</u> .</p> <p><b>No</b> INSTALL a new starter motor relay. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A21</u> .</p>
<b>A15 CHECK FOR VOLTAGE TO THE IGNITION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Ignition Switch C250.</li> <li>• Measure the voltage at ignition switch C250-9, circuit 1050 (LG/VT), harness side and ground.</li> </ul>  <p>N0050205</p> <ul style="list-style-type: none"> <li>• Is the voltage reading greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>A16</u> .</p> <p><b>No</b> VERIFY BJB fuse 1 (30 A) is OK. If OK, REPAIR the circuit 1050 (LG/VT). TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. If equipped with a fire suppression system, GO to <u>A21</u> .</p>
<b>A16 CHECK THE IGNITION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Carry out the Ignition Switch Component Test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• Did the ignition switch pass the component test?</li> </ul>	<p><b>Yes</b> GO to <u>A17</u> .</p> <p><b>No</b> INSTALL a new ignition switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A21</u> .</p>

<p><b>A17 CHECK FOR VOLTAGE TO CJB FUSE 1 (10A)</b></p> <ul style="list-style-type: none"> <li>• Disconnect: Central Junction Box (CJB) fuse 1 (10A).</li> <li>• Measure the voltage at the CJB input cavity of fuse 1 (10A), circuit 1522 (DG) and ground with the ignition switch in the START position.</li> </ul>  <p>N0066843</p> <p>• Is the voltage reading greater than 10 volts?</p>	<p><b>Yes</b> GO to <a href="#">A18</a> .</p> <p><b>No</b> VERIFY CJB fuse 1 (10 A) is OK. If OK, REPAIR circuit 1522 (DG). TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p>
<p><b>A18 CHECK FOR VOLTAGE AT THE DIGITAL TR SENSOR</b></p> <ul style="list-style-type: none"> <li>• Disconnect: Digital Transmission Range (TR) Sensor C167.</li> <li>• Measure the voltage between the digital TR sensor C167-12, circuit 262 (BN/PK), harness side and ground with the ignition switch in the START position.</li> </ul>  <p>N0087621</p> <p>• Is the voltage reading greater than 10 volts?</p>	<p><b>Yes</b> GO to <a href="#">A19</a> .</p> <p><b>No</b> REPAIR circuit 262 (BN/PK). TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p>
<p><b>A19 CHECK CIRCUIT 33 (WH/PK) FOR AN OPEN</b></p> <ul style="list-style-type: none"> <li>• Measure the resistance between BJB starter relay pin 86, circuit 33 (WH/PK), harness side and digital TR sensor C167-10, circuit 33 (WH/PK), harness side.</li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 307-05</a> , Selector Lever Cable Adjustment. If adjustment is OK, GO to <a href="#">A20</a> .</p> <p><b>No</b> REPAIR circuit 33 (WH/PK) for an open. TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p>

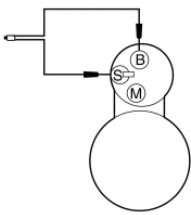
 <p>N0070606</p> <ul style="list-style-type: none"> <li>• Is the resistance reading less than 5 ohms?</li> </ul>	
<b>A20 CHECK THE TR SENSOR</b>	
<ul style="list-style-type: none"> <li>• <b>NOTICE:</b> Do not pry on connector. This will damage the connector and result in a transmission concern.</li> <li>• Measure the resistance between digital TR sensor pin 10 and pin 12, component side, with the selector lever in PARK and then NEUTRAL.</li> </ul>  <p>N0072490</p> <ul style="list-style-type: none"> <li>• Are all resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new BJB . TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p> <p><b>No</b> INSTALL a new digital TR sensor. REFER to <a href="#">Section 307-01</a> . TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">A21</a> .</p>
<b>A21 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING:</b> If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <a href="#">Section 100-02B</a> . Failure to follow these instructions may result in serious personal injury.</li> <li>• Verify that the fire suppression system is repowered. Refer to <a href="#">Section 100-02B</a> .</li> <li>• Is the fire suppression system repowered?</li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <a href="#">Section 100-02B</a> for diagnosis and testing of the fire suppression system.</p>

### Pinpoint Test B: Unusual Starter Noise

This pinpoint test is intended to diagnose the following:

- Starter mounting
- Flexplate/ring gear
- Starter motor

## PINPOINT TEST B: UNUSUAL STARTER NOISE

Test Step	Result / Action to Take
<b>B1 CHECK THE STARTER MOUNTING</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <b>Section 100-02B</b> . Failure to follow the instructions may result in serious personal injury.</li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <b>Section 100-02A</b> .</li> <li>• Inspect the starter motor mounting bolts for looseness.</li> <li>• <b>Is the starter motor mounted correctly?</b></li> </ul>	<p><b>Yes</b> GO to <b>B2</b> .</p> <p><b>No</b> INSTALL the starter motor correctly. REFER to <b>Starter Motor</b> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <b>B4</b> .</p>
<b>B2 CHECK FOR ENGINE NOISE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect a remote starter switch between the starter motor solenoid C197a, circuit 2037 (RD) and C197b, circuit 113 (YE/LB) terminals.</li> </ul>  <p>AJ0286-A</p> <ul style="list-style-type: none"> <li>• Engage the starter motor and verify the noise is due to the starter operation.</li> <li>• <b>Is the noise due to the starter motor engagement?</b></li> </ul>	<p><b>Yes</b> GO to <b>B3</b> .</p> <p><b>No</b> REFER to <b>Section 303-00</b> to continue the diagnosis. If diagnosis is complete and vehicle is equipped with fire suppression system, GO to <b>B4</b> .</p>
<b>B3 CHECK FOR UNUSUAL WEAR</b>	
<ul style="list-style-type: none"> <li>• Remove the starter motor. Refer to <b>Starter Motor</b> in this section.</li> <li>• Inspect the flexplate ring gear for damaged or worn teeth.</li> <li>• <b>Is the noise due to flexplate ring gear tooth damage?</b></li> </ul>	<p><b>Yes</b> INSTALL a new flexplate. REFER to <b>Section 303-01</b> . EXAMINE the starter pinion teeth. If damaged, INSTALL a new starter motor. REFER to <b>Starter Motor</b> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <b>B4</b> .</p> <p><b>No</b> INSTALL a new starter motor. REFER to <b>Starter Motor</b> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <b>B4</b> .</p>
<b>B4 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	

<ul style="list-style-type: none"> <li>• <b>⚠ WARNING:</b> If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 100-02B</u> . Failure to follow these instructions may result in serious personal injury.</li> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> .</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for diagnosis and testing of the fire suppression system.</p>
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## Component Tests

### Starter Motor - Motor Feed Circuit

**⚠ WARNING:** Always disconnect the battery ground cable at the battery before disconnecting the starter motor battery terminal lead. If a tool is shorted at the starter motor battery terminal, the tool can quickly heat enough to cause a skin burn. Failure to follow this instruction may result in serious personal injury.

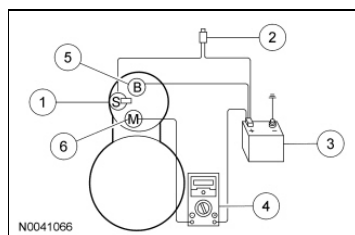
**NOTE:** Always connect the Fluke 77-IV Digital Multimeter at the component terminal rather than at the wiring end connector. Making a connection at the wiring end connector could result in false readings because the meter will not pick up a high resistance between the wiring connector and the component.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Make sure the battery is fully charged. Refer to Section 414-01 .

2. Connect a remote starter switch between the starter motor solenoid S-terminal and the battery positive (+) terminal.
3. Connect the Fluke 77-IV Digital Multimeter positive lead to the battery positive (+) post. Connect the negative lead to the starter motor solenoid M-terminal.

### Motor Feed Circuit



Item	Part Number	Description
1	-	S-terminal
2	-	Remote starter switch
3	10653	Battery
4	-	Fluke 77-IV Digital Multimeter
5	-	B-terminal
6	-	M-terminal



4. Engage the remote starter switch. Read and record the voltage. The voltage reading should be 0.5 volt or less.
5. If the voltage reading is 0.5 volt or less, go to the Starter Motor - Motor Ground Circuit component test.
6. If the voltage reading is greater than 0.5 volt, indicating excessive resistance, move the Fluke 77-IV Digital Multimeter negative lead to starter motor solenoid B-terminal and repeat the test. If the voltage reading at the B-terminal is lower than 0.5 volt, the concern is either in the connections at the starter motor solenoid or in the starter motor solenoid contacts.
7. Remove the cables from the starter motor solenoid B-, S- and M-terminals. Clean the cables and connections and reinstall the cables to the correct terminals. Repeat Steps 3 through 6. If the voltage drop reading is still greater than 0.5 volt when checked at the M-terminal or less than 0.5 volt when checked at the B-terminal, the concern is in the solenoid contacts. Install a new starter motor.
8. If the voltage reading taken at starter motor solenoid B-terminal is still greater than 0.5 volt after cleaning the cables and connections at the solenoid, the concern is either in the positive (+) battery cable connection or in the positive battery cable itself.
9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

By moving the Fluke 77-IV Digital Multimeter negative lead toward the battery and checking each mechanical connection point, the excessive voltage drop can be located. When the high reading disappears, the last mechanical point that was checked is the concern. Repair or install a new connection as required.

### Starter Motor - Motor Ground Circuit

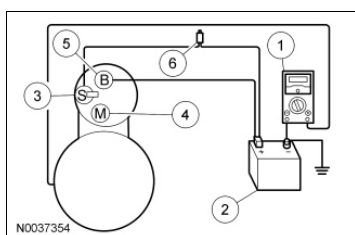
A slow cranking condition can be caused by resistance in the ground or return portion of the cranking circuit. Check the voltage drop in the ground circuit as follows:

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**


Connect a remote starter switch between starter motor solenoid S-terminal and the battery positive (+) terminal.

2. Connect the Fluke 77-IV Digital Multimeter positive lead to the starter motor housing (the connection must be clean and free of rust or grease). Connect the negative lead to the negative (-) battery terminal.

### Motor Ground Circuit



Item	Part Number	Description
1	-	Fluke 77-IV Digital Multimeter
2	10653	Battery
3	-	S-terminal
4	-	M-terminal
5	-	B-terminal
6	-	Remote starter switch

3. Engage the remote starter switch and crank the engine. Read and record the voltage reading. The reading should be 0.2 volt or less.
4. If the voltage drop is more than 0.2 volt, clean the negative cable connections at the battery and body connections, and retest.
5. If the voltage drop is greater than 0.2 volt, determine which way the current is flowing in the cable. Connect the Fluke 77-IV Digital Multimeter positive lead to the end of the cable nearest battery positive.
6. Connect the Fluke 77-IV Digital Multimeter negative lead to the terminal at the other end of the cable.
7.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Crank the engine and observe the voltage reading. The voltage reading should be 0.2 volt or lower. If the voltage drop is too high, clean the terminal ends. Retest, and if still high, install a new cable. If the voltage reading is less than 0.2 volt and the engine still cranks slowly, install a new starter motor.

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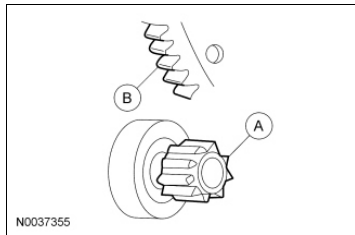
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**Starter Motor Drive Gear and Flywheel Ring Gear Inspection**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

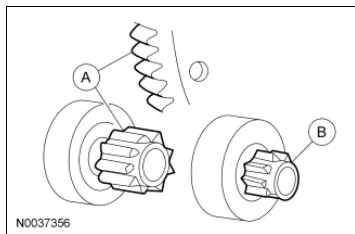
Remove the starter motor. For additional information, refer to [Starter Motor](#) in this section.

2. Check the wear patterns on the (A) starter drive and the (B) flexplate ring gear. If the wear pattern is normal, install the starter motor. For additional information, refer to [Starter Motor](#) in this section.

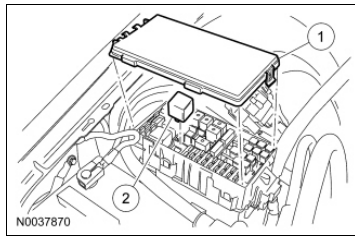


3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If the (A) starter drive gear and the flexplate ring gear are not fully meshing or the gears are (B) milled or damaged, install a new starter motor. For additional information, refer to [Starter Motor](#) in this section. Install a new flexplate ring gear. For additional information, refer to [Section 303-01](#) .



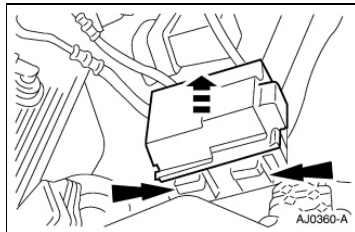


**Starter Motor Solenoid Relay - ISO Mini**

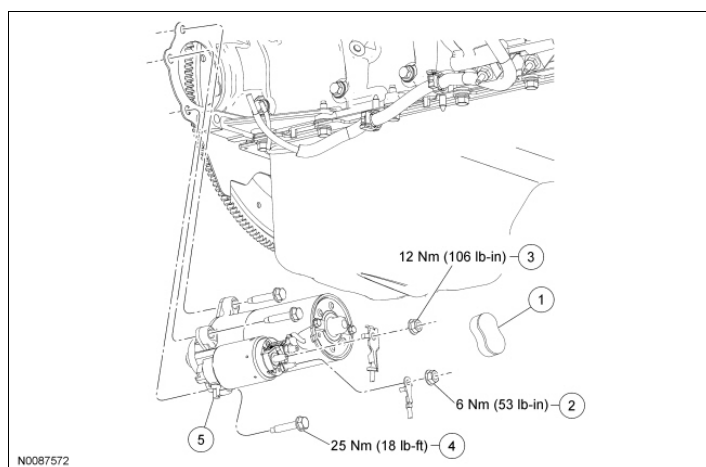
Item	Part Number	Description
1	-	Battery Junction Box (BJB) lid (part of 14A067)
2	11450	ISO starter motor relay

**Removal and Installation**

1. Press the clips inward and open the Battery Junction Box (BJB) lid.



2. Remove the ISO starter motor relay.
3. To install, reverse the removal procedure.

**Starter Motor**

Item	Part Number	Description
1	11N087	Terminal cover
2	W705790	Starter solenoid S-terminal nut
3	W706414	Starter solenoid B-terminal nut
4	W506510	Starter motor bolt (3 required)
5	11000	Starter motor

**Removal and Installation**


**⚠ WARNING:** Always disconnect the battery ground cable at the battery before disconnecting the starter motor battery terminal lead. If a tool is shorted at the starter motor battery terminal, the tool can quickly heat enough to cause a skin burn. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

- Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
- Remove the terminal cover on the starter solenoid.
- Remove the B-terminal nut and disconnect the wire.
  - To install, tighten to 12 Nm (106 lb-in).
- Remove the S-terminal nut and disconnect the wire.

- To install, tighten to 6 Nm (53 lb-in).
6. Remove the 3 bolts and the starter motor.
    - To install, the upper and lower starter bolts should first be finger-tight.
    - Tighten the 2 upper bolts to 25 Nm (18 lb-ft).
    - Tighten the lower bolt to 25 Nm (18 lb-ft).
  7.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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**General Specifications**

Item	Specification
Base ignition timing	10 degrees Before Top Dead Center (BTDC) (not adjustable)
Firing order	1-3-7-2-6-5-4-8
Spark plug gap (flexible fuel only)	1.04-1.19 mm (0.041-0.047 in)
Spark plug gap (gasoline fuel only)	1.32-1.42 mm (0.052-0.056 in)
Spark plug type (flexible fuel only)	AGSF-22FM1
Spark plug type (gasoline fuel only)	AGSF-32N

**Torque Specifications**

Description	Nm	lb-in
Coil-on-plug bolts	6	53
Spark plugs	18	159

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## Engine Ignition

This vehicle uses a coil-on-plug electronic ignition system. The coil-on-plug ignition system consists of the:

- PCM.
- Crankshaft Position (CKP) sensor.
- ignition coil-on-plug.
- spark plugs.

The PCM and the CKP sensor are also part of the electronic engine controls system. Refer to Section 303-14 .

Eight separate ignition coils:

- are controlled by the PCM for the correct firing sequence.
- are mounted directly above each spark plug.

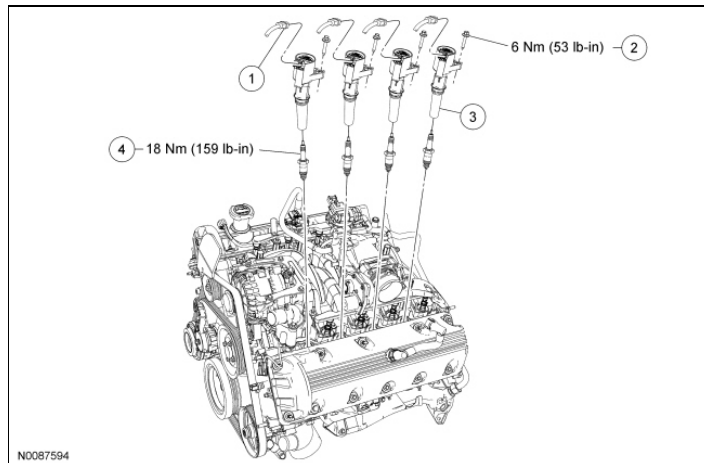
The spark plugs:

- change the high voltage pulse into a spark which ignites the fuel and air mixture.
  - originally equipped on the vehicle have a nickel alloy electrode for long life.
-

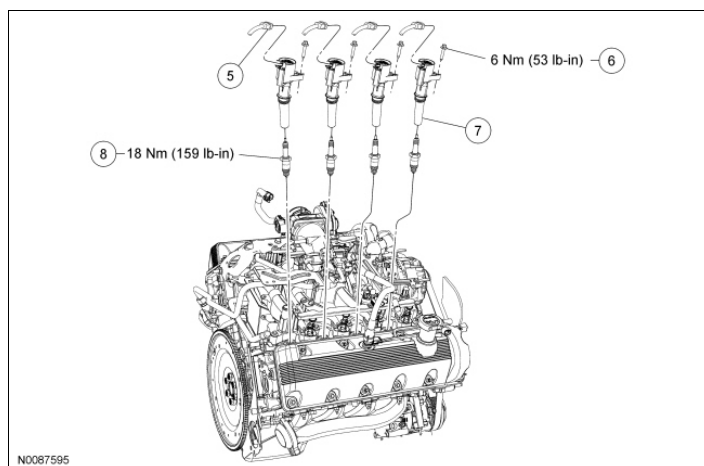
## **Engine Ignition**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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**Engine Ignition Components - Exploded View****LH Side**

Item	Part Number	Description
1	14A464	Ignition coil-on-plug electrical connector (4 required)
2	W706175	Ignition coil-on-plug bolt (4 required)
3	12A366	Ignition coil (4 required)
4	12405	Spark plug (4 required)

**RH Side**

Item	Part Number	Description
5	14A464	Ignition coil-on-plug electrical connector (4 required)
6	W706175	Ignition coil-on-plug bolt (4 required)
7	12A366	Ignition coil (4 required)
8	12405	Spark plug (4 required)

1. For additional information, refer to the procedures in this section.
-

## **Ignition Coil-On-Plug**

### **Removal and Installation**

#### **LH side**

1. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to [Section 303-12](#) .

#### **Both sides**

2. Disconnect the electrical connector from the ignition coil-on-plug.
  3. Remove the bolt from the ignition coil-on-plug.
    - To install, tighten to 6 Nm (53 lb-in).
  4. Remove the ignition coil-on-plug.
  5. To install, reverse the removal procedure.
-

## Spark Plugs

### Removal and Installation

1. Remove the ignition coil-on-plugs. For additional information, refer to Ignition Coil-On-Plug in this section.

2. **NOTICE:** Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.

**NOTE:** Use compressed air to remove any foreign material from the spark plug well before removing the spark plugs.

Remove the spark plugs.

- To install, tighten to 18 Nm (159 lb-in).

3. Inspect the spark plugs. For additional information, refer to Section 303-00.

4. To install, reverse the removal procedure.

- Adjust the spark plug gap on gasoline engines to 1.32-1.42 mm (0.052-0.056 in).
  - Adjust the spark plug gap on flexible fuel engines to 1.04-1.19 mm (0.041-0.047 in).
-

## Material

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-

## Torque Specifications

Description	Nm	lb-ft	lb-in
EGR system module bolts	25	18	-
EGR system module tube fittings	43	32	-
Intake manifold shield bolts	12	-	106

---

## Engine Emission Control

**NOTICE:** Do not permanently remove or render inoperative any part of the vehicle emission control system including related hardware. Failure to comply may violate applicable state and federal laws.

The engine emission control consists of the:

- EGR system.
- PCV system.

### EGR System

The EGR system returns a small amount of exhaust gas into the intake manifold. This reduces the overall combustion temperature. Cooler combustion temperatures provide a significant reduction of the Nitrogen Oxides (NOX) in the exhaust emissions.

The EGR system module tube connects the exhaust manifold to the EGR system module and provides a path to deliver exhaust vapors to the EGR system module.

The EGR vacuum regulator solenoid uses input from the PCM to achieve the calibrated level of EGR flow for various engine operating conditions.

The PCM controls the EGR system module opening via the vacuum regulator solenoid. When the EGR system module opens, exhaust gas flows to the intake manifold. The EGR system module transducer measures the delta pressure across the orifice located in the EGR system module gasket. This delta pressure signal is sent to the PCM providing an indication of the EGR mass flow that was delivered.

The amount of recirculated exhaust gas depends on:

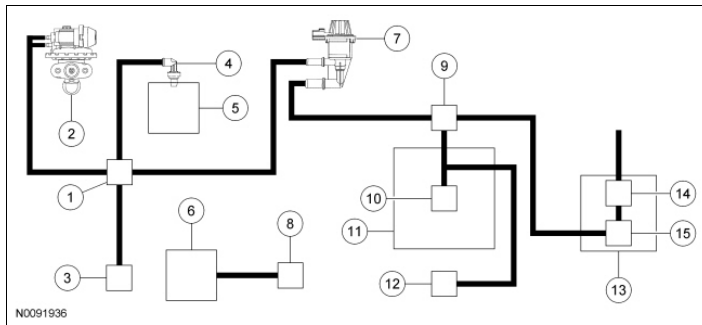
- engine rpm.
- intake manifold vacuum.
- exhaust backpressure.
- engine coolant temperature.
- throttle position.

### PCV System

The PCV system uses intake manifold vacuum to ventilate blow-by vapors from the crankcase and return the vapors to the intake manifold for combustion. The PCV valve varies the amount of blow-by vapors returned to the intake manifold based on available engine vacuum.

### Vehicle Emission Vacuum Routing





Item	Part Number	Description
1	9A859	Throttle Body (TB) spacer
2	9D475	EGR system module
3	9F972	Fuel rail pressure and temperature sensor
4	6A666	PCV valve
5	6582	RH valve cover
6	6A505	LH valve cover
7	9G641	Evaporative Emission (EVAP) canister purge valve
8	9F805	Air Cleaner (ACL) outlet tube
9	-	Fuel Tank Pressure (FTP) sensor (part of 9C047)
10	9B190	Fuel Limit Vent Valve (FLVV)
11	9002	Fuel tank
12	9034	Fuel tank filler pipe
13	9E857	EVAP canister
14	9S315	Dust separator
15	9F845	EVAP canister vent solenoid

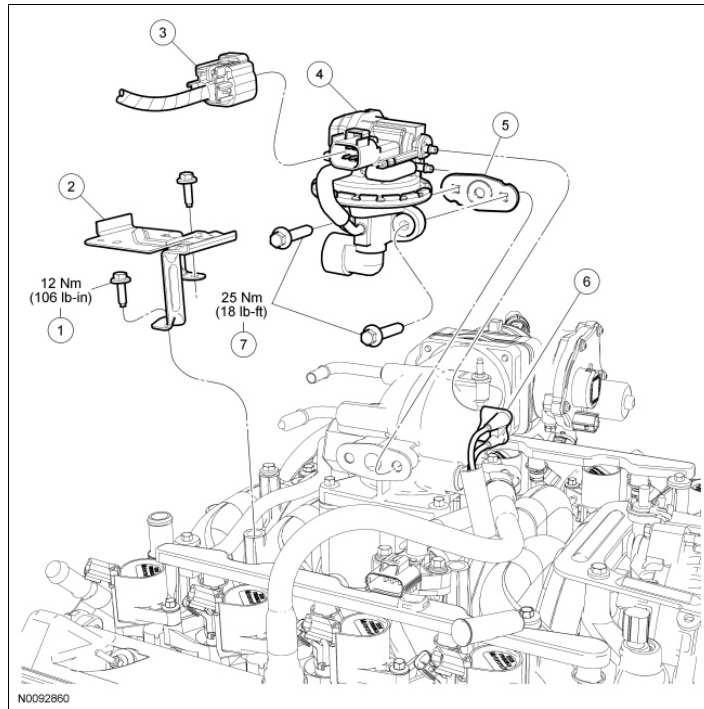
## **Engine Emission Control**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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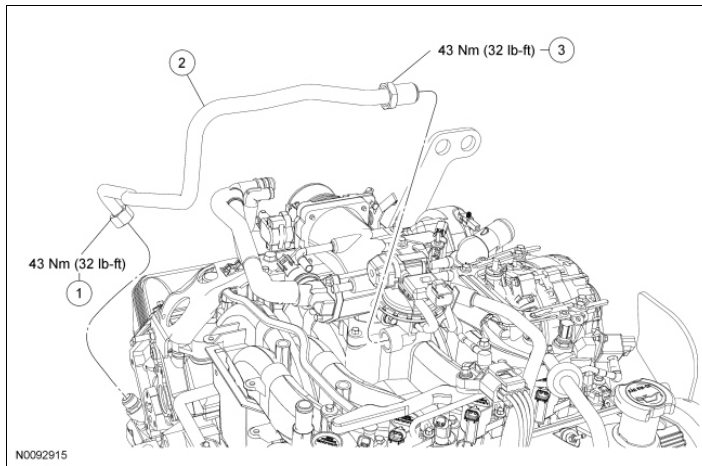
## Exhaust Gas Recirculation (EGR) System Components - Exploded View

### EGR System Module



Item	Part Number	Description
1	N807309	Intake manifold shield bolt (2 required)
2	9F460	Intake manifold shield
3	14A464	EGR system module electrical connector
4	9D475	EGR system module
5	9D476	EGR system module gasket
6	9E498	EGR system module vacuum connector
7	-	EGR system module retaining bolts (2 required)

### EGR System Module Tube



Item	Part Number	Description
1	-	EGR system module tube-to-exhaust manifold fitting (part of 9D477)
2	9D477	EGR system module tube
3	-	EGR system module tube-to-EGR system module fitting (part of 9D477)

1. For additional information, refer to the procedures in this section.

---

---

**Exhaust Gas Recirculation (EGR) System Module****Material**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-

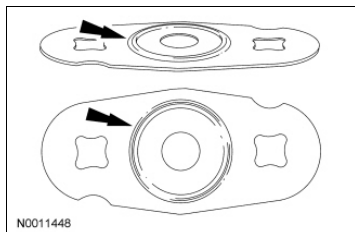
**Removal and Installation**

1. Disconnect the EGR system module electrical and vacuum connectors.
2. Remove the 2 bolts and the intake manifold shield.
  - To install, tighten to 12 Nm (106 lb-in).
3. Disconnect the EGR system module tube-to-EGR system module fitting.
  - To install, tighten to 43 Nm (32 lb-ft).
4. Remove the 2 bolts and the EGR system module.
  - To install, tighten to 25 Nm (18 lb-ft).
5. Remove and discard the EGR system module gasket.
6. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the Exhaust Gas Recirculation (EGR) system module gasket.

**NOTE:** If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

Clean the mating surfaces of any residual gasket material.

7. To install, reverse the removal procedure.
  - Install a new EGR system module gasket with the side that has the raised circle facing the intake manifold.





## Exhaust Gas Recirculation (EGR) System Module Tube

### Removal and Installation

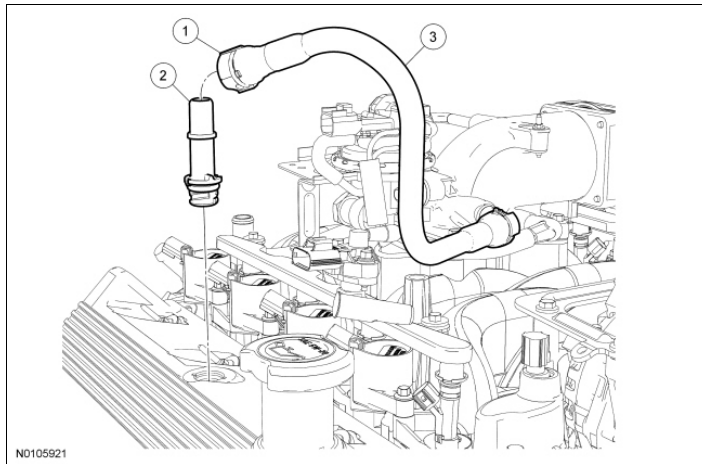
1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Remove the 2 bolts and the intake manifold shield.
  - To install, tighten to 12 Nm (106 lb-in).
3. Disconnect the EGR system module tube-to-EGR system module fitting.
  - To install, tighten to 43 Nm (32 lb-ft).
4. Disconnect the EGR system module tube-to-exhaust manifold fitting.
  - To install, tighten to 43 Nm (32 lb-ft).
5. Remove the EGR system module tube from the vehicle.
6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

---

**Positive Crankcase Ventilation (PCV) Valve**

Item	Part Number	Description
1	-	Crankcase ventilation tube-to-PCV valve quick connect coupling (part of 9E499)
2	6A666	PCV valve
3	6K817	RH crankcase ventilation tube

**Removal and Installation**

1. Disconnect the crankcase ventilation tube-to-PCV valve quick connect coupling and position the tube aside. For additional information, refer to [Section 310-00](#).
2. **NOTICE: A new Positive Crankcase Ventilation (PCV) valve must be installed if removed. Upon removal, the plastic retaining ears of the PCV valve are sheared.**

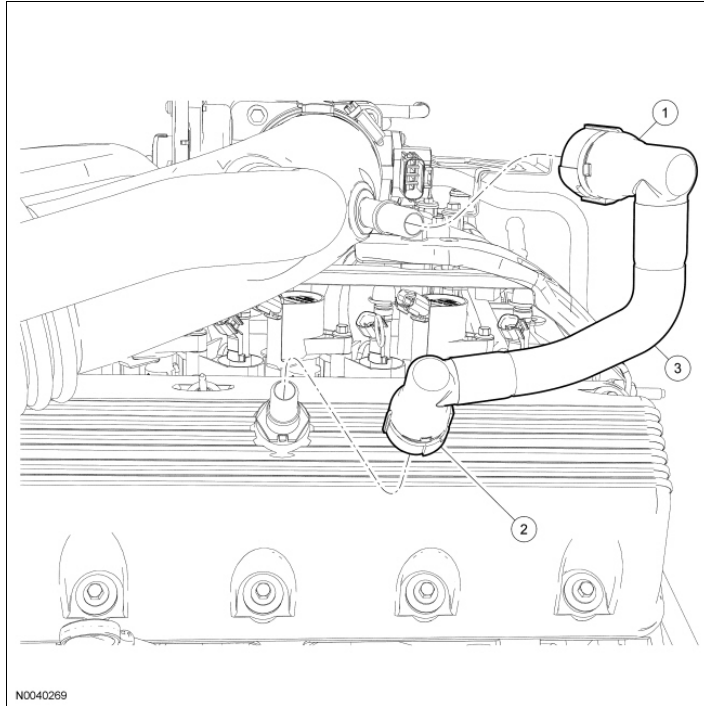
Rotate the PCV valve counterclockwise and remove it from the valve cover.

- Discard the PCV valve.

3. To install, reverse the removal procedure.
  - Install a new PCV valve.

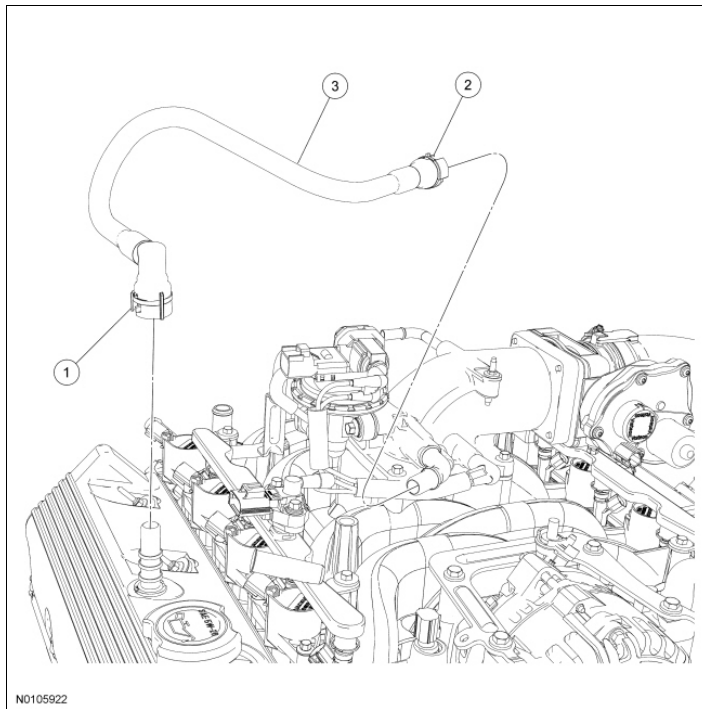




**Crankcase Ventilation Tube****LH Crankcase Ventilation Tube**

Item	Part Number	Description
1	-	LH crankcase ventilation tube-to-Air Cleaner (ACL) outlet pipe quick connect coupling (part of 9G499)
2	-	LH crankcase ventilation tube-to-valve cover fitting quick connect coupling (part of 9G499)
3	6758	LH crankcase ventilation tube

**RH Crankcase Ventilation Tube**



Item	Part Number	Description
1	-	RH crankcase ventilation tube-to-PCV valve quick connect coupling (part of 9E499A)
2	-	RH crankcase ventilation tube-to-Throttle Body (TB) spacer quick connect coupling (part of 9E499A)
3	6K817	RH crankcase ventilation tube

### Removal and Installation

#### LH crankcase ventilation tube

1. Disconnect the LH crankcase ventilation tube-to-Air Cleaner (ACL) outlet pipe quick connect coupling. For additional information, refer to [Section 310-00](#).
2. Disconnect the LH crankcase ventilation tube-to-valve cover fitting quick connect coupling and remove the tube. For additional information, refer to [Section 310-00](#).

#### RH crankcase ventilation tube

3. Disconnect the RH crankcase ventilation tube-to-PCV valve quick connect coupling. For additional information, refer to [Section 310-00](#).
4. Disconnect the RH crankcase ventilation tube-to-Throttle Body (TB) spacer quick connect coupling and remove the tube. For additional information, refer to [Section 310-00](#).

#### All crankcase ventilation tubes

5. To install, reverse the removal procedure.



**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Air Cleaner (ACL) assembly mounting nuts	6	53
ACL outlet pipe clamps	4	35

---

## **Intake Air Distribution and Filtering**

The air intake system consists of the:

- engine Air Cleaner (ACL) assembly.
- replaceable ACL element.
- Mass Air Flow (MAF) sensor.
- ACL outlet pipe and resonator assembly.

The air intake system:

- cleans intake air with a replaceable ACL element.
- measures airflow and intake air temperature with a MAF sensor.

The engine ACL contains an ACL element made of treated, pleated paper. A new ACL element must be installed periodically as scheduled. Engine performance and fuel economy are adversely affected when maximum restriction of the ACL element is reached.

---

### **Intake Air Distribution and Filtering**

Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

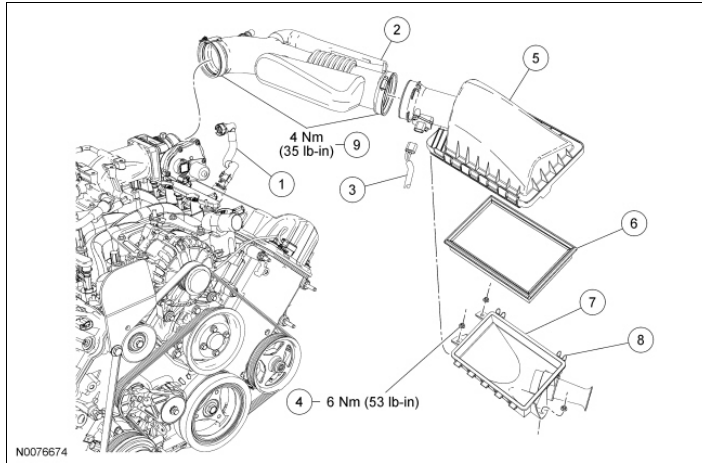
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## SECTION 303-12: Intake Air Distribution and Filtering

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## REMOVAL AND INSTALLATION

Procedure revision date: 08/19/2009

**Intake Air System Components - Exploded View**

Item	Part Number	Description
1	6758	Crankcase ventilation hose
2	9F805	Air Cleaner (ACL) outlet pipe
3	14A464	Mass Air Flow (MAF) sensor electrical connector
4	N621906	ACL retainer nut (3 required)
5	9600	ACL cover
6	9601	ACL element
7	-	ACL tray (part of 9600)
8	9628	ACL cover retaining clip (2 required)
9	9C632	ACL outlet pipe clamps

1. For additional information, refer to the procedures in this section.

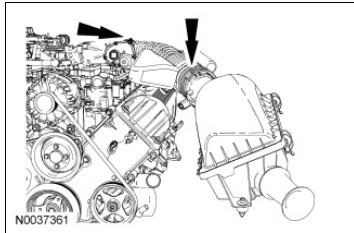




## Air Cleaner Outlet Pipe

### Removal and Installation

1. Disconnect the crankcase ventilation hose quick connect coupling from the Air Cleaner (ACL) outlet pipe. For additional information, refer to Section 310-00 .
2. Loosen the clamps on both ends of the ACL outlet pipe.
  - To install, tighten to 4 Nm (35 lb-in).



3. Remove the ACL outlet pipe.
    - To install, position the ACL outlet pipe on the Throttle Body (TB) first and line up the alignment tabs to correctly seat the pipe.
  4. To install, reverse the removal procedure.
-

## **Air Cleaner**

### **Removal and Installation**

1. Disconnect the Mass Air Flow (MAF) sensor electrical connector.
  2. Loosen the clamp and disconnect the Air Cleaner (ACL) outlet pipe from the ACL cover.
    - To install, tighten to 4 Nm (35 lb-in).
  3. Remove the 3 nuts and the engine ACL assembly.
    - To install, tighten to 6 Nm (53 lb-in).
  4. To install, reverse the removal procedure.
-

## **Air Cleaner Element**

### **Removal**

1. Release the 2 Air Cleaner (ACL) cover retaining clips from the ACL cover.
2. Lift the ACL cover and remove the ACL element.

### **Installation**

1. Lift the ACL cover and install the ACL element.
2. **NOTE:** It is important that all hinge features are fully engaged from the cover to the tray after servicing the air filter element.

Install the 2 ACL cover retaining clips to the ACL cover.

---

## Material

Item	Specification	Fill Capacity
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	-

## Torque Specifications

Description	Nm	lb-in
Evaporative Emission (EVAP) canister nuts	6	53

---

## Evaporative Emissions

**NOTE:** The vehicle emission vacuum routing diagrams are contained in the Description and Operation subsection of the Engine Emissions Control section. Refer to Section 303-08 .

The Evaporative Emission (EVAP) system consists of the:

- EVAP canister purge valve.
- EVAP canister.
- EVAP canister vent solenoid.
- fuel vapor tube assembly (includes a grade vent valve and a Fuel Tank Pressure (FTP) sensor).
- dust separator.
- fuel tank filler cap.

The EVAP system:

- utilizes an On-Board Refueling Vapor Recovery (ORVR) system that captures the fuel vapors from the vehicle's fuel tank during refueling.
- prevents hydrocarbon emissions from reaching the atmosphere.
- stores fuel vapors in the EVAP canister that are generated during vehicle operation or hot soak, until they can be consumed by the engine during normal engine operation.
- routes the stored fuel vapors to the engine during engine operation.
- is controlled by the PCM which, using various sensor inputs, calculates the desired amount of purge flow. The PCM regulates the purge flow, induced by the application of intake manifold vacuum, by varying the duty cycle applied to the EVAP canister purge valve.

The fuel vapors are routed:

- from the fuel tank to the EVAP canister through the fuel vapor tube assembly.
- to the engine when the EVAP canister purge valve is opened by the PCM.

The FTP sensor:

- is part of the fuel vapor tube assembly.
- monitors the pressure levels in the fuel tank.
- communicates the pressure reading to the PCM during the OBD II leak test.

The EVAP canister:

- is located under the rear of the vehicle, just behind the fuel tank.
- contains activated carbon.
- stores fuel vapors.

The fuel tank filler cap:

- relieves system vacuum below 3.8 kPa (15.26 in H<sub>2</sub>O).

The EVAP canister vent solenoid:

- is normally open.

- seals the EVAP system for the inspection and maintenance (I/M 240) test and OBD II leak and pressure tests.
- is attached to the EVAP canister.
- is repaired as a separate item.

The dust separator:

- is attached to the EVAP canister.
- prevents suspended dust and dirt particles from entering the EVAP system.
- is repaired as a separate item.

The EVAP canister purge valve:

- is attached to the cowl.
- is normally closed.
- regulates the purging of the EVAP canister.
- is controlled by the PCM.

The EVAP system monitor:

- is a self-test strategy within the PCM, which tests the integrity of the EVAP system.
- monitors the EVAP system for leaks.
- monitors electronic EVAP components for abnormally high or low voltages.
- monitors for correct EVAP system operation.
- uses negative and positive leak test methods to test and activate the EVAP system.

The engine ON EVAP leak-check monitor:

- is executed by the individual components of the enhanced EVAP system. Intake manifold vacuum is utilized to reach a target vacuum on the EVAP system. The FTP sensor is used by the engine ON EVAP leak-check monitor to determine if the target vacuum necessary to carry out the leak-check on the EVAP system has been reached. Once target vacuum on the EVAP system is achieved, the change in EVAP system vacuum over a calibrated period of time determines if a leak exists.

The Engine Off Natural Vacuum (EONV) EVAP leak-check monitor is executed:

- once the engine ON EVAP leak-check monitor is completed and the key is turned OFF. The EONV EVAP leak-check monitor determines if a leak is present when the naturally occurring change in the fuel tank pressure or vacuum does not exceed a calibrated limit during a calibrated amount of time. A separate, low-power consuming microprocessor in the PCM manages the EONV leak-check. The engine OFF EVAP leak-check monitor is executed by the individual components of the enhanced EVAP system.
-







## **Evaporative Emissions**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

---

**Evaporative Emission System Leak Test**

## Special Tool(s)

 ST2817-A	VACUTEC Smoke Machine Fuel Evaporative Emission System Tester 218-0002 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Phase 1 - Leak Verification**

1. Run the EVAP Test with the scan tool.
2. **NOTE:** Some small leaks may not be detected using the EVAP Test. If the system has passed the test but a leak is still suspected, proceed to Phase 2.

If the Evaporative Emission (EVAP) system failed the EVAP Test, proceed to Phase 2.

**Phase 2 - System Leak Check**

1. **⚠ WARNING:** The fire suppression system backup power supply must be depleted before lifting the vehicle or when repairing or replacing any of the following:

- Fire suppression system components
- Components located near the fire suppression manual switch
- Fuel tank and components located near the fuel tank
- Rear axle and components located near the rear axle

To deplete the backup power supply, disconnect the battery and wait at least 1 minute. Be sure to disconnect all auxiliary batteries and power supplies (if equipped). Failure to follow these instructions may result in serious personal injury. Disconnect the upper vapor tube-to- EVAP canister purge valve quick connect coupling. For additional information, refer to [Section 310-00](#).

2. Connect the VACUTEC Smoke Machine Fuel Evaporative Emission System Tester to the upper EVAP canister purge valve fitting. For additional information, refer to the manufacturer's instructions.
3. **NOTE:** The battery ground cable was previously disconnected in the vapor tube quick connect coupling procedure.

Connect the battery ground cable. For additional information, refer to [Section 414-01](#).

4. **NOTE:** In the scan tool, the EVAP canister purge valve is referred to as the EVAP vapor management valve.

Open the EVAP canister purge valve with the scan tool.

5. Close the canister vent solenoid with the scan tool.

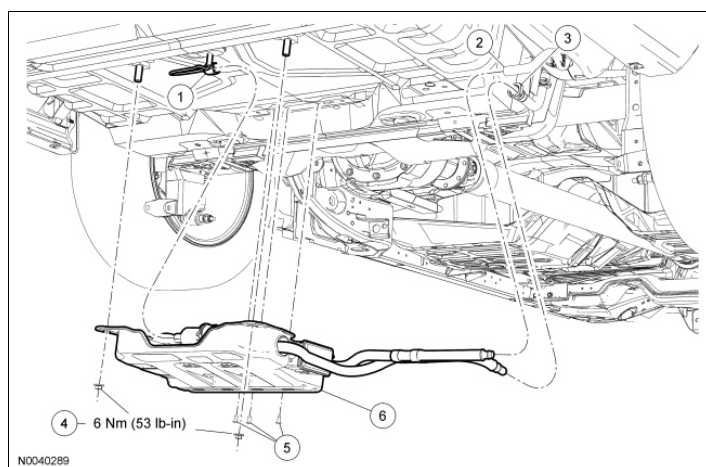
6. Carefully turn the fuel tank filler cap counterclockwise until the thread disengages and position aside.
7. **NOTE:** If smoke does not exit the fuel tank filler pipe neck area after the system is pressurized, open the canister vent solenoid with the scan tool to allow the air to purge. Once smoke is seen at the canister vent solenoid, close the canister vent solenoid with the scan tool.

Introduce smoke from the VACUTEC Smoke Machine Fuel Evaporative Emission System Tester into the EVAP system and verify that smoke is exiting the fuel tank filler pipe neck area. For additional information, refer to the manufacturer's instructions.

8. Install the fuel tank filler cap once smoke is observed exiting the fuel tank filler pipe neck area.
9. Continue to enter smoke into the system for 60 seconds to obtain pressure.
10. Press and release the remote start button in intervals of 15 seconds ON and 15 seconds OFF while checking for exiting smoke.
11. Use the halogen light provided with the VACUTEC Smoke Machine Fuel Evaporative Emission System Tester to follow the EVAP system path and look for smoke exiting at the source of the leak(s).
12. Repair any leaks as necessary.
13. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Repeat the leak test until the system passes. If equipped with a fire suppression system, repower the system.

---

**Evaporative Emission Canister**

Item	Part Number	Description
1	14A464	Evaporative Emission (EVAP) canister vent solenoid electrical connector
2	9K318	Fresh air hose
3	-	Fuel vapor tube assembly-to- EVAP canister vapor tube quick connect coupling (part of 9C047)
4	N621906S	EVAP canister nuts (2 required)
5	W709653	EVAP canister rivets (3 required)
6	9E857	EVAP canister

**Removal and Installation**


1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

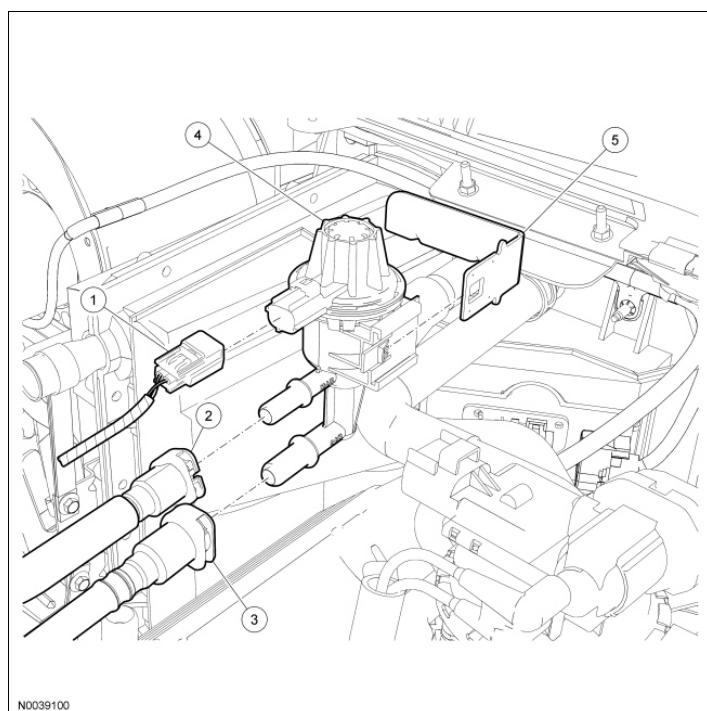
**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .
3. Disconnect the Evaporative Emission (EVAP) canister vent solenoid electrical connector.
4. Remove the 3 EVAP canister rivets.
  - Drill out the center of the original rivets to remove and install new rivets upon installation.
5. Disconnect the fresh air hose from the dust separator.
6. Disconnect the fuel vapor tube assembly-to- EVAP canister vapor tube quick connect coupling. For additional information, refer to Section 310-00 .
7. Remove the 2 nuts and the EVAP canister.
  - To install, tighten to 6 Nm (53 lb-in).
8.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Carry out the Evaporative Emission System Leak Test. For additional information, refer to Evaporative Emission System Leak Test in this section.
-

**Evaporative Emission Canister Purge Valve**

Item	Part Number	Description
1	14A464	Evaporative Emission (EVAP) canister purge valve electrical connector
2	-	Fuel vapor tube-to- EVAP canister purge valve quick connect coupling (part of 9G271)
3	-	Fuel vapor tube-to- EVAP canister purge valve quick connect coupling (part of 9G271)
4	9G641	EVAP canister purge valve
5	9G683	EVAP canister purge valve bracket

**Removal and Installation**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

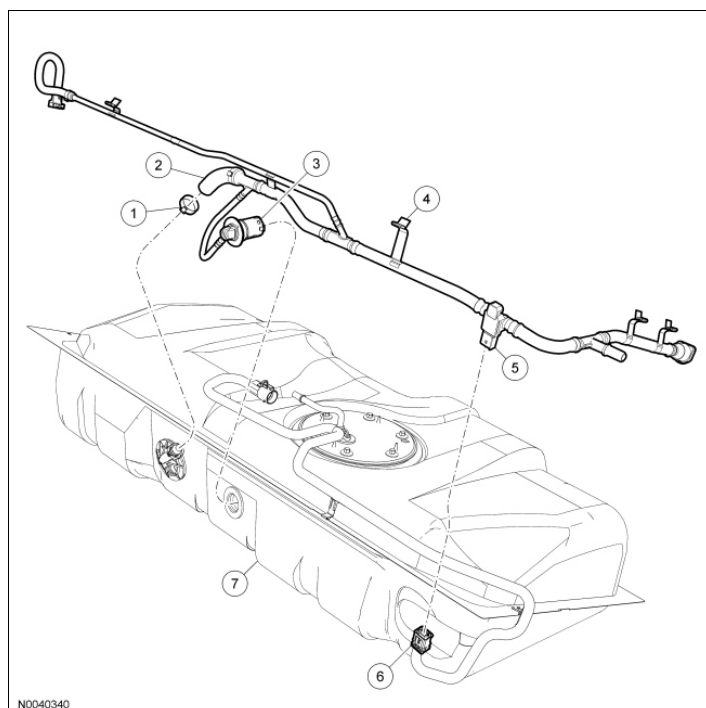
1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .

2. Disconnect the Evaporative Emission (EVAP) canister purge valve electrical connector.
  3. Disconnect the 2 fuel vapor tube-to- EVAP canister purge valve quick connect couplings. For additional information, refer to Section 310-00 .
  4. Remove the EVAP canister purge valve.
    - Depress the lock tab on the EVAP canister purge valve and release it from the bracket.
  5. To install, reverse the removal procedure.
    - Carry out the Evaporative Emission System Leak Test. For additional information, refer to Evaporative Emission System Leak Test in this section.
-

**Fuel Vapor Tube Assembly**

## Material

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A



Item	Part Number	Description
1	-	Fuel vapor tube assembly clamp (part of 9C047)
2	9C047	Fuel vapor tube assembly
3	-	Grade vent valve (part of 9C047)
4	-	Fuel vapor tube assembly retainer clip (4 required)
5	-	Fuel Tank Pressure (FTP) sensor (part of 9C047)
6	14A464	FTP sensor electrical connector
7	9002	Fuel tank

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the fuel tank. For additional information, refer to [Section 310-01](#) .



2. Disconnect the Fuel Tank Pressure (FTP) sensor electrical connector.
3. Disconnect the 4 fuel vapor tube assembly retainer clips from the fuel tank.
4. Remove and discard the fuel vapor tube assembly clamp.
  - Install a new crimp style clamp during installation.
5. **NOTE:** Be careful when removing the grade vent valve from the fuel tank grommet to avoid damaging either component.

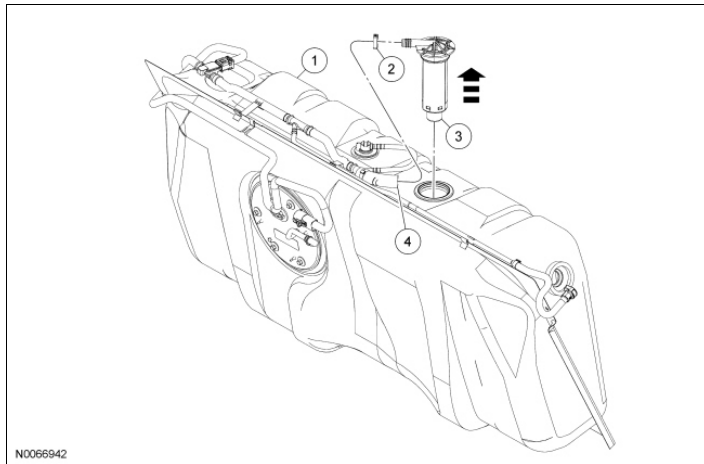
Remove the grade vent valve from the fuel tank.

6. Remove the fuel vapor tube assembly from the fuel tank.
7. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

**NOTE:** Lubricate the grade vent valve grommet with clean engine oil.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

---

**Fill Limiting Vent Valve**

Item	Part Number	Description
1	9002	Fuel tank
2	9S275	Fuel vapor tube assembly-to-fill limiting vent valve clamp (part of 9C047)
3	9B190	Fill limiting vent valve
4	9C047	Fuel vapor tube assembly

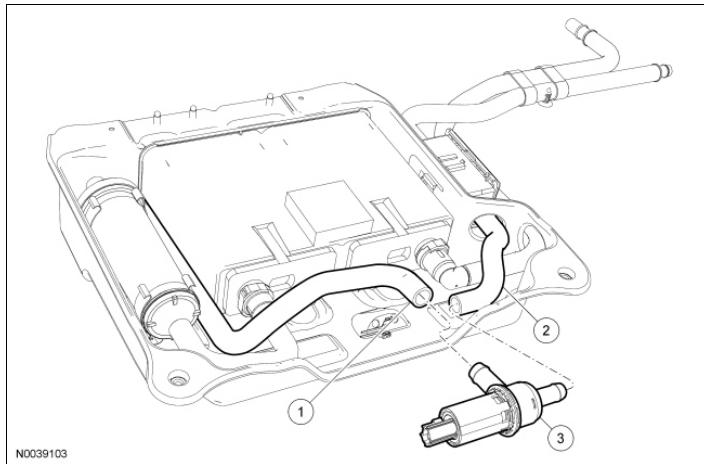
**Removal and Installation**

1. Remove the fuel tank. For additional information, refer to Section 310-01 .
2. Release the clamp and disconnect the fuel vapor tube assembly-to-fill limiting vent valve hose.
3. **NOTE:** Be careful when removing the fill limiting vent valve from the fuel tank grommet to avoid damaging either component.

Remove the fill limiting vent valve from the tank.

4. To install, reverse the removal procedure.
  - Carry out an Evaporative Emission System Leak Test. For additional information, refer to Evaporative Emission System Leak Test in this section.



**Evaporative Emission Canister Vent Solenoid**

Item	Part Number	Description
1	9K318	Evaporative Emission (EVAP) canister vapor tube
2	9K318	EVAP canister vapor tube
3	9F945	EVAP canister vent solenoid

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

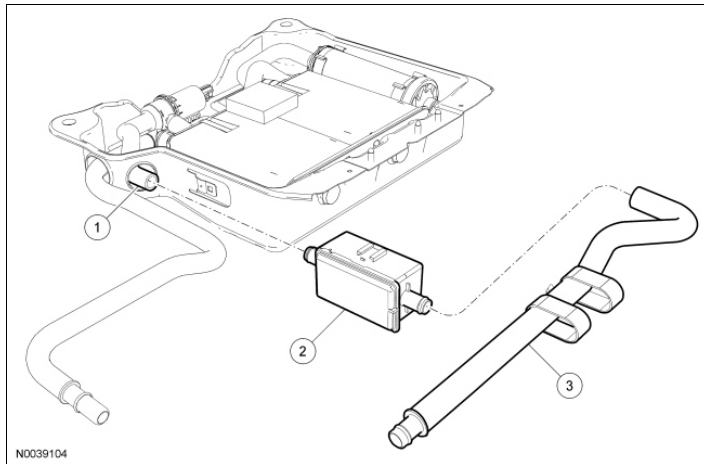
Remove the Evaporative Emission (EVAP) canister assembly. For additional information, refer to [Evaporative Emission Canister](#) in this section.

2. Disconnect the 2 vapor tubes and remove the EVAP canister vent solenoid.

3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.



**Dust Separator**

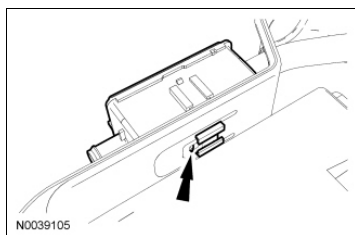
Item	Part Number	Description
1	9K318	Evaporative Emission (EVAP) canister vapor tube
2	9S315	Dust separator
3	9K313	Fresh air hose

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the Evaporative Emission (EVAP) canister. For additional information, refer to [Evaporative Emission Canister](#) in this section.

2. Disconnect the fresh air hose from the dust separator.
3. Depress the lock tab and release the dust separator from the EVAP canister bracket.



4. Disconnect the EVAP canister vapor tube and remove the dust separator.
5. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.



## Material

Item	Specification	Fill Capacity
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A	-
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	-
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-	-

## Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor stud bolts	25	18	-
A/C tube bracket nut	9	-	80
Camshaft Position (CMP) sensor bolt	10	-	89
Catalyst Monitor Sensor (CMS) <sup>a</sup>	-	-	-
Crankshaft Position (CKP) sensor bolt	10	-	89
CKP sensor wiring harness clip nut	9	-	80
Cylinder Head Temperature (CHT) sensor <sup>a</sup>	-	-	-
Fuel rail pressure and temperature sensor bolts	5	-	44
Generator bracket bolt	10	-	89
Heated Oxygen Sensor (HO2S) <sup>a</sup>	-	-	-
Knock Sensor (KS)	20	-	177
Lower generator bolt	25	18	-
Mass Air Flow (MAF) sensor retaining screws	6	-	53
PCM retaining bolt	10	-	89
Throttle Position (TP) sensor screws	3	-	27

<sup>a</sup> Refer to the procedure in this section.





## Electronic Engine Controls

The electronic engine controls consist of the:

- Camshaft Position (CMP) sensor.
- Crankshaft Position (CKP) sensor.
- Cylinder Head Temperature (CHT) sensor.
- fuel rail pressure and temperature sensor.
- Heated Oxygen Sensor (HO2S).
- Catalyst Monitor Sensor (CMS).
- Mass Air Flow (MAF) sensor.
- PCM.
- Knock Sensor (KS).

The CMP sensor:

- sends the PCM a signal indicating camshaft position used for fuel synchronization.

The CKP sensor:

- sends the PCM a signal indicating crankshaft position.
- is essential for calculating spark timing.

The CHT sensor:

- is mounted into the wall of the cylinder head and is not connected to any coolant passages.
- sends a signal to the PCM indicating the cylinder head temperature.
  - ◆ If the temperature exceeds approximately 121°C (250°F), the PCM disables 4 fuel injectors at a time. The PCM will alternate which fuel injectors are disabled every 32 engine cycles. The 4 cylinders that are not being fuel injected act as air pumps to aid in cooling the engine.
  - ◆ If the temperature exceeds approximately 166°C (330°F), the PCM disables all of the fuel injectors until the engine temperature drops below approximately 154°C (310°F).
- If the engine reaches critical temperature, the following happens:
  - ◆ The coolant temperature gauge pointer will read fully hot at approximately 121°C (250°F).

The fuel rail pressure and temperature sensor:

- measures the pressure and temperature of the fuel rail and sends these signals to the PCM.
- uses intake manifold vacuum as a pressure reference.

The HO2S :

- has the ability to create a voltage signal dependent on exhaust oxygen content.
- provides feedback information to the PCM used to calculate fuel delivery.

The CMS (s):

- has the ability to create a voltage signal dependent on exhaust oxygen content.
- provides a voltage to the PCM used to calculate catalytic converter integrity.

The MAF sensor:

- sends the PCM a signal indicating fresh air flow rate of air entering the engine.

The PCM carries out the following functions:

- accepts input from various engine sensors to complete the required fuel flow rate necessary to maintain a prescribed air/fuel ratio throughout the entire operational range.
- outputs a command to the fuel injectors to meter the appropriate quantity of fuel.
- determines and compensates for the age of the vehicle and its uniqueness, also automatically senses and compensates for changes in altitude.

The KS :

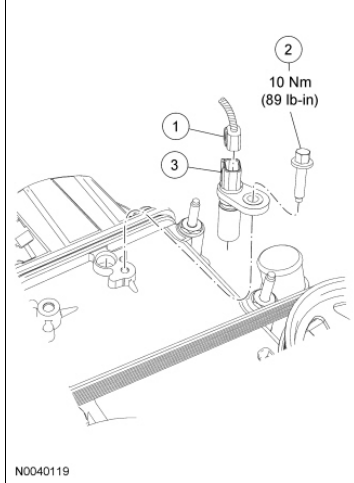
- is used to detect engine detonation.
  - sends a voltage signal to the PCM.
  - is able to provide a signal which retards the ignition timing, as necessary.
-

### **Electronic Engine Controls**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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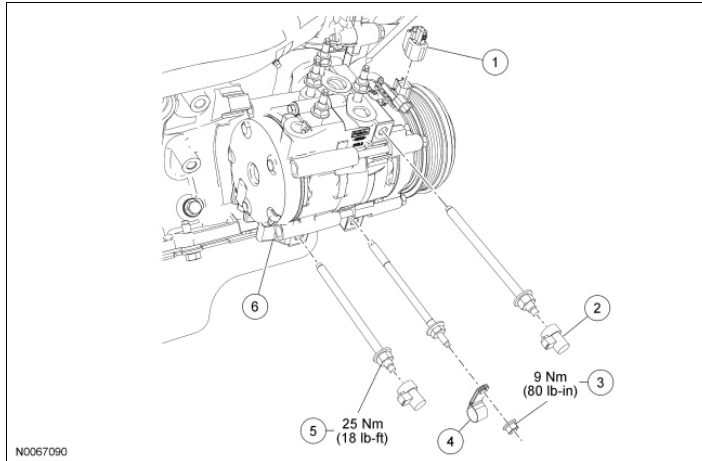
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**Camshaft Position (CMP) Sensor****Removal and Installation**

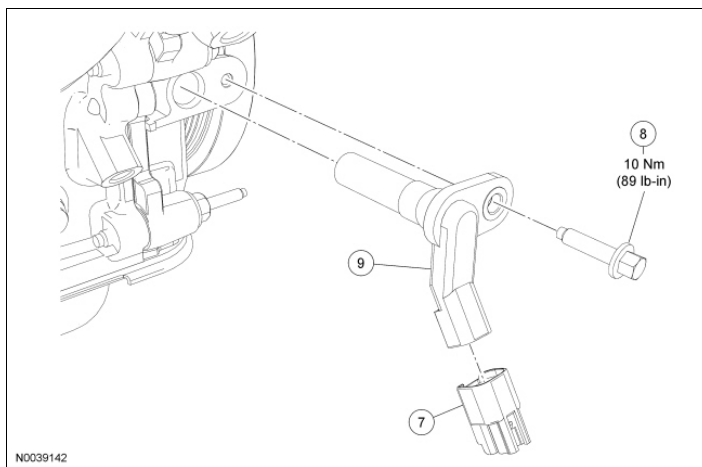
Item	Part Number	Description
1	14A464	Camshaft Position (CMP) sensor electrical connector
2	N806155	CMP sensor bolt
3	6B288	CMP sensor

1. Disconnect the Camshaft Position (CMP) sensor electrical connector.
  2. Remove the bolt and the CMP sensor.
    - To install, tighten to 10 Nm (89 lb-in).
  3. To install, reverse the removal procedure.
-



**Crankshaft Position (CKP) Sensor****A/C Compressor**

Item	Part Number	Description
1	14A464	A/C compressor clutch electrical connector (part of 14A280)
2	14A163	Battery cable retainer (part of 14A280) (2 required)
3	W520111	A/C tube bracket nut
4	19N704	A/C tube bracket
5	N806184	A/C compressor stud bolt (3 required)
6	19D629	A/C compressor

**Crankshaft Position (CKP) Sensor**

Item	Part Number	Description
7	14A464	

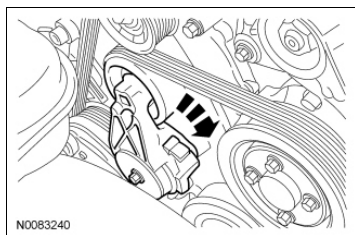
		Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
8	N806155	CKP sensor bolt
9	6C315	CKP sensor

**Removal and Installation**

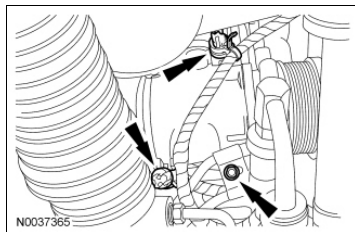
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Rotate the tensioner and remove the drive belt from the A/C compressor pulley.



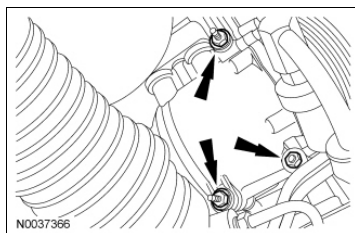
3. Disconnect the A/C compressor field coil electrical connector.
4. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
5. Remove the nut and detach the 2 wiring harness clips.
  - To install, tighten to 9 Nm (80 lb-in).



6. **NOTE:** It is not necessary to remove the A/C compressor stud bolts.


Loosen the 3 A/C compressor stud bolts enough to slide the compressor down one inch, allowing access for CKP sensor removal.

- To install, tighten to 25 Nm (18 lb-ft).



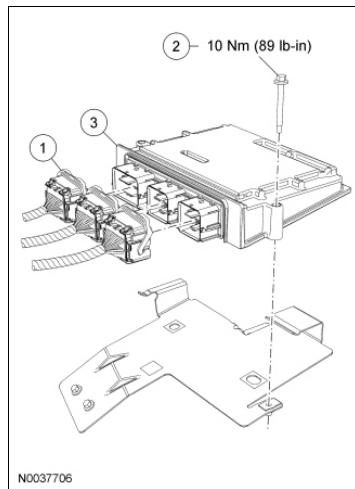
7. Remove the bolt and the CKP sensor.
  - To install, tighten to 10 Nm (89 lb-in).



8.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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**Powertrain Control Module (PCM)**

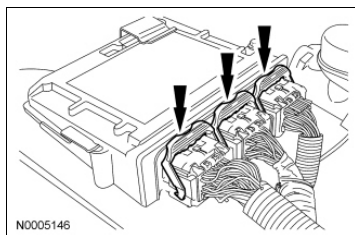
Item	Part Number	Description
1	14A464	PCM electrical connector (3 required)
2	W506503	PCM retaining bolt
3	12A651	PCM

**Removal**

1. **NOTE:** Any PCM replacement will require that ALL customer keys are available to be programmed at the time of installation. PCM replacement DOES NOT require new keys.

Retrieve the module configuration. Carry out the module configuration retrieval steps of the Programmable Module Installation (PMI) procedure. For additional information, refer to [Section 418-01](#).

2. Release the clips and disconnect the 3 PCM electrical connectors.



3. Remove the bolt and the PCM.

**Installation**

1. Install the PCM and the bolt.
  - Tighten to 10 Nm (89 lb-in).
2. Connect the 3 PCM electrical connectors and install the clips.
3. Restore the module configuration. Carry out the module configuration restore steps of the Programmable Module Installation (PMI) procedure. For additional information, refer to [Section](#)

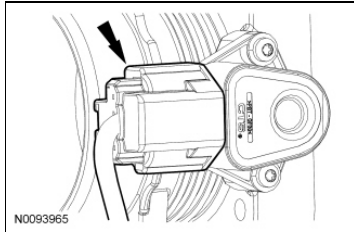
418-01 .

4. Reprogram the Passive Anti-Theft System (PATS). Carry out the Key Programming Using Two Programmed Keys procedure. For additional information, refer to Section 419-01 .
-

## Throttle Position (TP) Sensor

### Removal

1. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to [Section 303-12](#) .
2. Disconnect the Throttle Position (TP) sensor electrical connector.

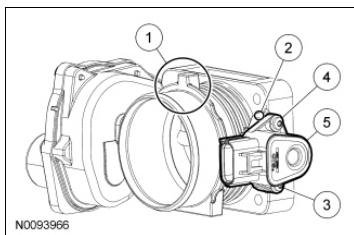


3. **NOTICE:** Do not put direct heat on the Throttle Position (TP) sensor or any other plastic parts because heat damage may occur. Damage may also occur if Electronic Throttle Body (ETB) temperature exceeds 120°C (248°F).

**NOTE:** Do not use power tools.

Remove the TP sensor.

1. Using a suitable heat gun, apply heat to the top of the Electronic Throttle Body (ETB) until the top TP sensor bolt ear reaches approximately 55°C (130°F), this should take no more than 3 minutes using an 1,100-watt heat gun. The heat gun should be about 25.4 mm (1 in) away from the ETB .
2. Monitor the temperature of the top TP sensor bolt ear on the ETB with a suitable temperature measuring device, such as a digital temperature laser or infrared thermometer, while heating the ETB .
3. Using hand tools, quickly remove the bolt farthest from the heat source first and discard.
4. Using hand tools, remove the remaining bolt and discard.
5. Remove and discard the TP sensor.



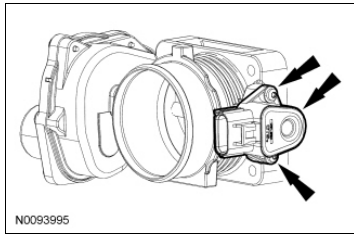
### Installation

1. **NOTE:** When installing the new TP sensor, make sure that the radial locator tab on the TP sensor is aligned with the radial locator hole on the ETB .

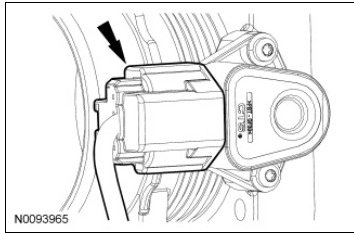
**NOTE:** Do not use power tools.

Install the new TP sensor.

- Using hand tools, install the 2 new bolts.
  - ◆ Tighten to 3 Nm (27 lb-in).

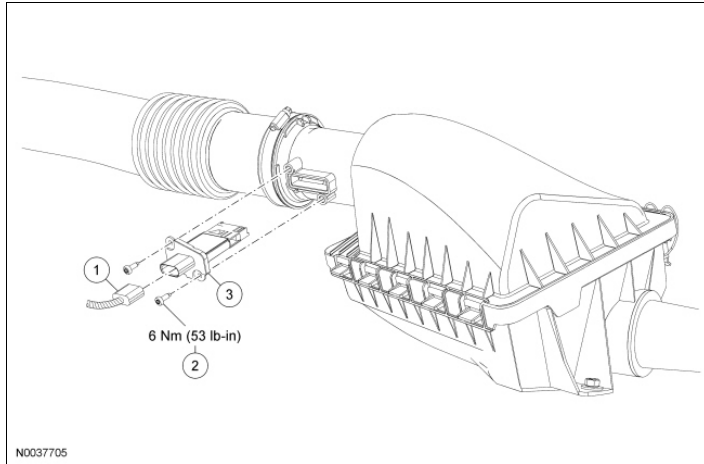


2. Connect the TP sensor electrical connector.



3. Install the ACL outlet pipe. For additional information, refer to [Section 303-12](#) .

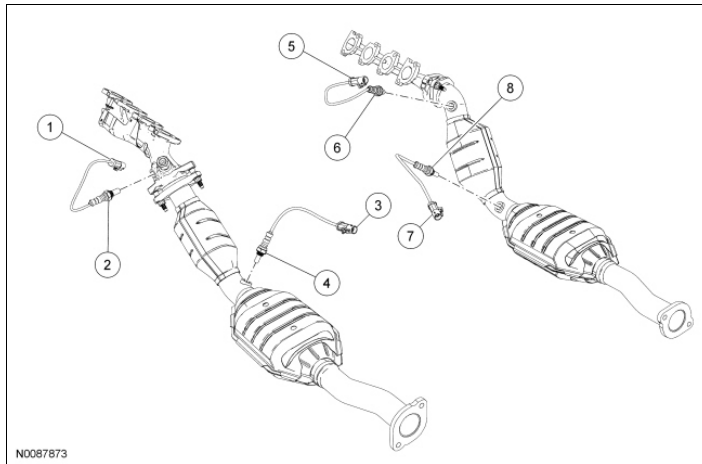
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**Mass Air Flow (MAF) Sensor****Removal and Installation**

Item	Part Number	Description
1	14A464	Mass Air Flow (MAF) sensor electrical connector
2	W709207	MAF sensor retaining screw (2 required)
3	12B579	MAF sensor

1. Disconnect the Mass Air Flow (MAF) sensor electrical connector.
2. Remove the 2 MAF sensor retaining screws.
  - To install, tighten to 6 Nm (53 lb-in).
3. Remove the MAF sensor.
4. To install, reverse the removal procedure.



**Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor - Exploded View**

Item	Part Number	Description
1	14A464	LH Heated Oxygen Sensor (HO2S) electrical connector
2	9F472	LH HO2S
3	14A464	LH Catalyst Monitor Sensor (CMS) electrical connector
4	9G444	LH CMS
5	14A464	RH HO2S electrical connector
6	9F472	RH HO2S
7	14A464	RH CMS electrical connector
8	9G444	RH CMS

1. For additional information, refer to the procedures in this section.





**Heated Oxygen Sensor (HO2S)**

## Special Tool(s)

A line drawing of a cylindrical socket with a hexagonal base and a central opening. The part number 303-476 is printed on the side.	Socket, Exhaust Gas Oxygen Sensor 303-476 (T94P-9472-A)
---	--

## Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-

**Removal and Installation**

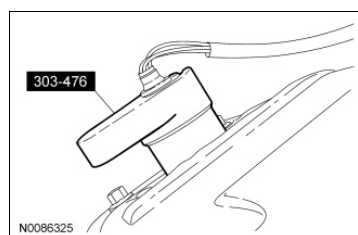
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
3. **NOTE:** If necessary, lubricate the sensor threads with penetrating and lock lubricant to assist in removal.

Using the Exhaust Gas Oxygen Sensor Socket, remove the HO2S .

- Calculate the correct torque wrench setting for the following torque. [Refer to the Torque Wrench Adapter Formulas in the Appendix.](#)
- To install, tighten to 40 Nm (30 lb-ft).




4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Apply a light coat of anti-seize lubricant to the threads of the HO2S .
-

**Catalyst Monitor Sensor**

## Special Tool(s)

	Socket, Exhaust Gas Oxygen Sensor 303-476 (T94P-9472-A)
---	--

## Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A
Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) XL-1 (US); CXC-51-A (Canada)	-

**Removal and Installation**

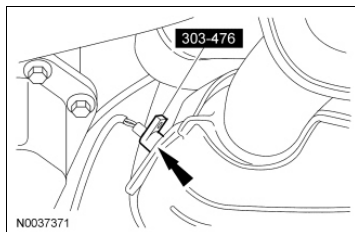
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Disconnect the Catalyst Monitor Sensor (CMS) electrical connector.
3. **NOTE:** If necessary, lubricate the sensor threads with penetrating and lock lubricant to assist in removal.

Using the Exhaust Gas Oxygen Sensor Socket, remove the CMS .

- Calculate the correct torque wrench setting for the following torque. [Refer to the Torque Wrench Adapter Formulas in the Appendix.](#)
- To install, tighten to 40 Nm (30 lb-ft).



4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

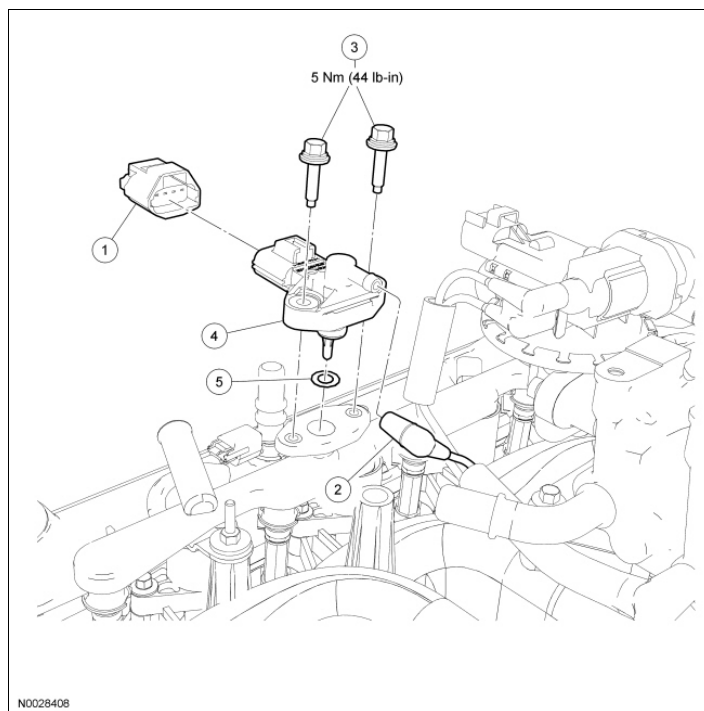
To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Apply a light coat of anti-seize lubricant to the threads of the catalyst monitor sensor.
-

**Fuel Rail Pressure and Temperature Sensor**

## Material

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Removal and Installation**

Item	Part Number	Description
1	14A464	Fuel rail pressure and temperature sensor electrical connector
2	9E498	Fuel rail pressure and temperature sensor vacuum connector
3	N808874	Fuel rail pressure and temperature sensor bolts (2 required)
4	9F972	Fuel rail pressure and temperature sensor
5	-	Fuel rail pressure and temperature sensor O-ring seal

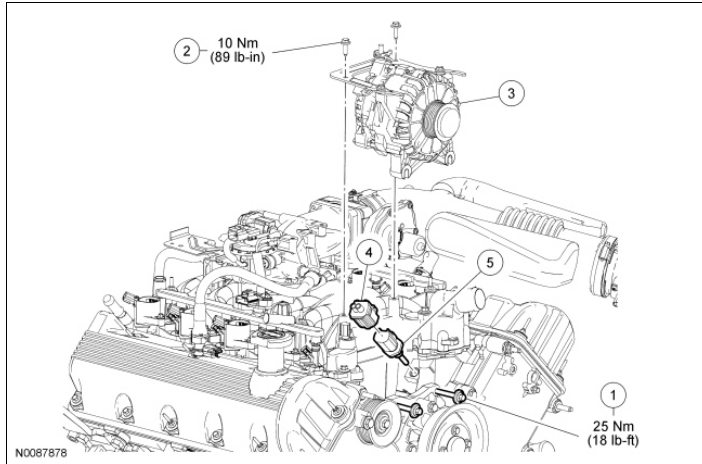
- ⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present

**and may be ignited. Failure to follow these instructions may result in serious personal injury.**

**⚠ WARNING: Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.**

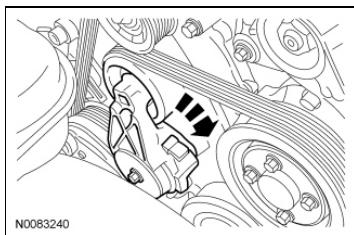
Release the fuel system pressure. For additional information, refer to Section 310-00 .

2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .
  3. Disconnect the fuel rail pressure and temperature sensor electrical connector.
  4. Disconnect the fuel rail pressure and temperature sensor vacuum connector.
  5. Remove the 2 bolts and the fuel rail pressure and temperature sensor.
    - To install, tighten to 5 Nm (44 lb-in).
  6. Remove and discard the O-ring seal.
    - Install a new O-ring seal and lubricate it with clean engine oil.
  7. To install, reverse the removal procedure.
-

**Cylinder Head Temperature (CHT) Sensor****Removal and Installation**

Item	Part Number	Description
1	N811268	Lower generator bolt (2 required)
2	N807309	Generator bracket bolt (2 required)
3	10300	Generator and bracket assembly
4	14A464	Cylinder Head Temperature (CHT) sensor electrical connector (part of 12B637)
5	6G004	CHT sensor

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#).
2. Rotate the tensioner clockwise and remove the accessory drive belt from the generator pulley.



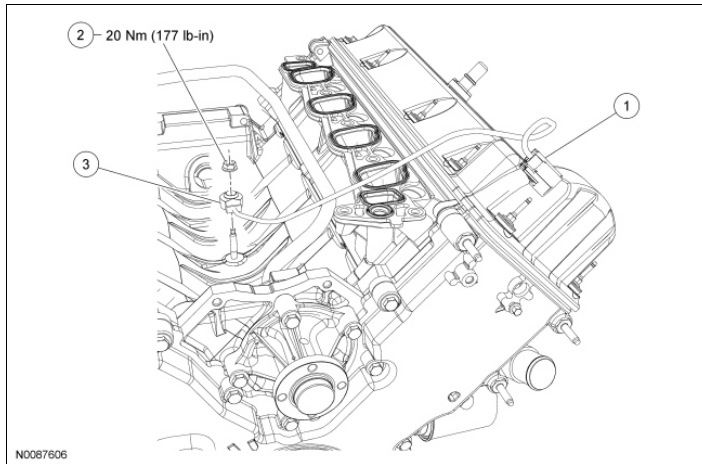
3. Loosen the 2 lower generator bolts.
  - To install, tighten to 25 Nm (18 lb-ft).
4. Remove the 2 generator bracket bolts and position the generator and bracket aside.
  - To install, tighten to 10 Nm (89 lb-in).
5. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.
6. Using a 19 mm (0.74 in) 12 point crowfoot wrench, remove the CHT sensor.
  - Calculate the correct torque wrench setting for the following torque. [Refer to the Torque Wrench Adapter Formulas in the Appendix.](#)
  - To install, tighten to 26 Nm (19 lb-ft).



7. **NOTE:** The CHT sensor is not to be reused. Always install a new sensor.

To install, reverse the removal procedure.

---

**Knock Sensor (KS)**

Item	Part Number	Description
1	14A464	Knock Sensor (KS) electrical connector
2	N804178	KS nut
3	12A699	KS

**Removal and Installation**

1. Remove the intake manifold. For additional information, refer to [Section 303-01](#) .
2. Disconnect the Knock Sensor (KS) electrical connector.
3. Remove the nut and the KS .
  - To install, tighten to 20 Nm (177 lb-in).
4. To install, reverse the removal procedure.



**Alignment Specifications**

Item	LH	RH	Total/ Split
<b>Front - Crown Victoria/Grand Marquis (Air Suspension)</b>			
Camber	-0.40°	-0.40°	0°±
	±0.75°	±0.75°	0.75°
Caster	6.2°±	6.4°±	-0.20°±
	0.75°	0.75°	0.75°
Toe @ curb ride height (positive value is toe in, negative value is toe out)	-	-	-0.15° ± 0.20°
<b>Front - Crown Victoria/Grand Marquis (Base)/Coil Spring Rear</b>			
Camber	-0.40°	-0.40°	0°±
	±0.75°	±0.75°	0.75°
Caster	5.9°±	6.1°±	-0.20°±
	0.75°	0.75°	0.75°
Toe @ curb ride height (positive value is toe in, negative value is toe out)	-	-	-0.15° ± 0.20°
<b>Front - Crown Victoria/Grand Marquis (Police/Taxi/Fleet)</b>			
Camber	-0.40°	-0.40°	0°±
	±0.75°	±0.75°	0.75°
Caster	5.7°	5.9°	-0.20°±
	±0.75°	±0.75°	0.75°
Toe @ curb ride height (positive value is toe in, negative value is toe out)	-	-	-0.15° ± 0.20°

**General Specifications**

Item	Specification
<b>Ball Joint Deflection</b>	
Lower	0-0.4 mm (0-0.016 in)
Upper	0-0.2 mm (0-0.008 in)

<b>Front Ride Height</b>	
Front (base)	66 mm (2.59 in) ± 10.0 mm (0.39 in)
<b>Rear Ride Height</b>	
Base (coil)	124.0 mm (4.88 in) ± 10.0 mm (0.39 in)
Non Police-Fleet (coil)	133.0 mm (5.23 in) ± 10.0 mm (0.39 in)
Police (coil)	145.0 mm (5.7 in) ± 10.0 mm (0.39 in)
Rear (Air)	118.0 mm (4.64 in) ± 10.0 mm (0.39 in)
<b>Vehicle Lean (Side-to-Side Differences)</b>	
Front wheel opening - maximum	12.7 mm (0.5 in)
Rear wheel opening - maximum	12.7 mm (0.5 in)

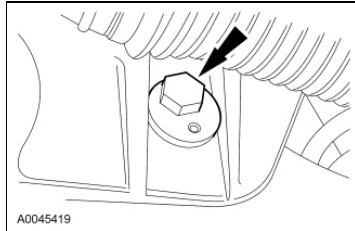
### Torque Specifications

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>
Cam bolt nuts	238	176
Rearward lower arm bushing-to-lower arm nut	175	128
Tie-rod jam nut	55	41



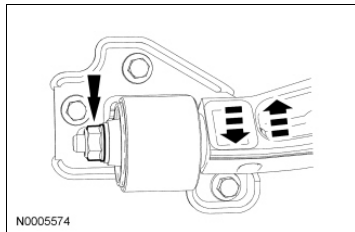
## Wheel Alignment Angles

### Camber Adjustment



Camber is adjusted by rotating cam bolts that are located at the forward pivot bushing of the lower control arms. A retaining flag must be removed and discarded prior to adjusting.

### Caster Adjustment

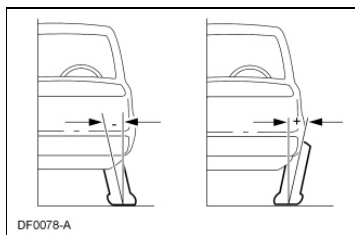


Caster is adjusted by loosening the lower arm rearward pivot bushing nut and moving the arm inward or outward. When adjusting the LH caster, a centering washer must be removed and discarded prior to adjusting.

Toe is adjusted by loosening the spindle tie-rod jam nut and rotating the spindle tie rod.

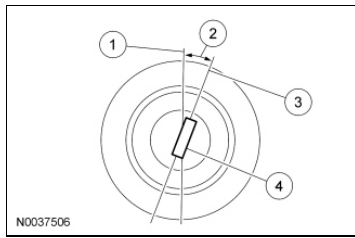
## Camber

### Negative and Positive Camber



Camber is the vertical tilt of the wheel when viewed from the front. Camber can be positive or negative and has a direct effect on tire wear.

### Caster

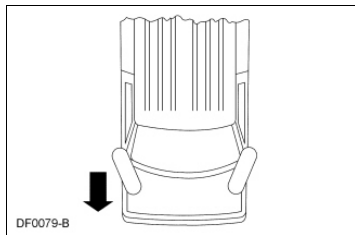


Item	Description
1	True vertical
2	Positive caster
3	Ball joint centerline
4	Pivot centerline

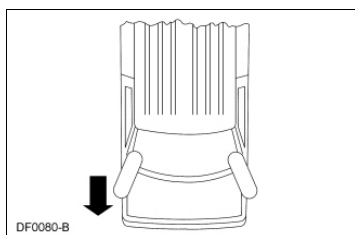
Caster is the deviation from vertical of an imaginary line drawn through the ball joints when viewed from the side. The caster specifications in this section will give the vehicle the best directional stability characteristics when loaded and driven. The caster setting is not related to tire wear.

## Toe

### Positive Toe (Toe In)



### Negative Toe (Toe Out)



The vehicle toe setting affects tire wear and directional stability.

## Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel corrections to maintain a straight path down a level road.

## Shimmy



Shimmy, as observed by the driver, is large, consistent, rotational oscillations of the steering wheel resulting from large, side-to-side (lateral) tire/wheel movements.

Shimmy is usually experienced near 64 km/h (40 mph) and can begin or be amplified when the tire contacts pot holes or irregularities in the road surface.

### **Nibble**

Sometimes confused with shimmy, nibble is a condition resulting from tire interaction with various road surfaces and observed by the driver as small rotational oscillations of the steering wheel.

### **Poor Returnability/Sticky Steering**

Poor returnability and sticky steering is used to describe the poor return of the steering wheel to center after a turn or the steering correction is completed.

### **Drift/Pull**

Pull is a tugging sensation, felt by the hands on the steering wheel, that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with hands off the steering wheel.

- A vehicle-related drift/pull, on a flat road, will cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull may be induced by conditions external to the vehicle (for example, wind or road crown).

### **Poor Groove Feel**

Poor groove feel is characterized by little or no buildup of turning effort felt in the steering wheel as the wheel is rocked slowly left and right within very small turns around center or straight-ahead (under 20 degrees of steering wheel turn). Efforts may be said to be "flat on center."

- Under 20 degrees of turn, most of the turning effort that builds up comes from the mesh of gear teeth in the steering gear. In this range, the steering wheel is not yet turned enough to feel the effort from the self-aligning forces at the road wheel or tire patch.
  - In the diagnosis of a roadability problem, it is important to understand the difference between wander and poor groove feel.
-



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## Suspension System

### Inspection and Verification

1. Road test the vehicle.
  - If any suspension alignment or ride height concerns are present, GO to Symptom Chart - Suspension System.
  - Verify the customer concern by carrying out a road test on a smooth road. If any vibrations are present, refer to GO to Symptom Chart - NVH.
2. Inspect the tires.
  - Check the tire pressures with all normal loads in the vehicle and the tires cold. Refer to the Vehicle Certification (VC) label.
  - Verify that all tires are sized to specification. Refer to the VC label.
  - Inspect the tires for incorrect wear and damage. Install new tires as necessary.
3. Inspect the chassis and underbody.
  - Remove any excessive accumulation of mud, dirt or road deposits from the chassis and underbody.
4. Inspect for aftermarket equipment.
  - Check for aftermarket changes to the steering, suspension, and wheel and tire components (such as competition or heavy duty). The specifications shown in this manual do not apply to vehicles equipped with aftermarket equipment.

### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• Front or rear suspension components</li> <li>• Suspension fastener(s)</li> <li>• Incorrect spring usage</li> <li>• Spring(s)</li> <li>• Shock absorber(s)</li> <li>• Suspension bushing(s)</li> <li>• Steering system components</li> <li>• Wheel bearing(s)</li> <li>• Non-OEM parts or modifications</li> </ul>

5. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step.

6. If the fault is not visually evident, GO to Symptom Chart - Suspension System or GO to Symptom Chart - NVH .

### Symptom Chart - Suspension System

Symptom Chart - Suspension System

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

#### ConditionPossible SourcesAction

- Squeak or grunt - noise from the front suspension, occurs more in cold ambient temperatures. More noticeable over rough roads or when turning
- Front stabilizer bar insulators
- Under these conditions, the noise is acceptable. CHECK TSBs.
- Clunk - noise from the front suspension, occurs in and out of turns
- Loose front suspension
- INSPECT for loose nuts or bolts. TIGHTEN to specifications. REFER to Section 204-01 for front suspension and Section 204-02 for rear suspension.
- Clunk - noise from the rear suspension, occurs when shifting from REVERSE to DRIVE
- Loose rear suspension components
- INSPECT for loose or damaged rear suspension components. REPAIR or INSTALL new components as necessary. REFER to Section 204-02 .
- Click or pop - noise from the front suspension. More noticeable over rough roads or over bumps
- Worn or damaged ball joint(s)
- CARRY OUT a ball joint inspection. INSTALL new ball joint(s) or control arm(s) as necessary. REFER to Section 204-00 .
- Front suspension noise - a squeak, creak or rattle noise. Occurs mostly over bumps or rough roads
- Front suspension components

- Loose or damaged shock absorber(s) or shock absorber bushing(s)
- Damaged spring or spring mount(s)
- Damaged or worn control/radius arm bushing(s)
- Worn or damaged stabilizer bar bushings or link(s)
  
- INSPECT the front suspension. INSTALL new components as necessary. REFER to Section 204-01 .
  
- Rear suspension noise - a squeak, creak or rattle noise. Occurs mostly over bumps or rough roads
  
- Loose or damaged rear shock absorber(s) or shock absorber bushing(s)
- Damaged spring or spring mount(s)
- Damaged or worn control arm bushing(s)
- Worn or damaged stabilizer bar bushing(s) or link(s)
  
- INSPECT the rear suspension. INSTALL new components as necessary. REFER to Section 204-02 .
  
- Shudder - occurs during acceleration from a slow speed or stop
  
- Incorrect ride height causing incorrect driveline angle
  
- REFER to Section 205-00 for driveline angle diagnosis.
  
- Shimmy
  
- Loose wheel nut(s)
  
- TIGHTEN the nut(s) to specification. REFER to Section 204-04 .
  
- Loose front suspension fastener(s)
  
- TIGHTEN the fastener(s) to specification. REFER to Section 204-01 .
  
- Loose front wheel bearing(s)
  
- INSPECT the front wheel bearing(s). INSTALL new bearing(s) as necessary. REFER to Section 204-01 .
  
- Shock absorber(s)
  
- INSTALL new shock absorbers as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
  
- Shimmy - most noticeable on coast/deceleration. Also hard steering condition
  
- Excessive positive caster
  
- CHECK the wheel alignment. REFER to Camber and Caster Adjustment in this section. ADJUST as necessary.
  
- Rough/harsh ride
  
- Incorrect tire pressure
  
- ADJUST the tire pressure. REFER to the Vehicle Certification (VC) label.

- Shock absorber(s)
- INSTALL new shock absorbers as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
- Spring(s)
- MEASURE the ride height. REFER to Ride Height Measurement in this section. INSTALL new springs as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.
- Loose, worn or damaged suspension component(s)
- INSTALL new suspension component(s) as necessary. REFER to Section 204-01 for front suspension or Section 204-02 for rear suspension.

## Pinpoint Tests

### Pinpoint Test A: Vehicle Drifts/Pulls

**This pinpoint test is intended to diagnose the following:**

- Unevenly loaded vehicle
- Tire pressure
- Tire forces
- Brake drag
- Incorrect vehicle alignment
- Steering system

#### PINPOINT TEST A: VEHICLE DRIFTS/PULLS

Test Step	Result / Action to Take
<b>A1 CHECK FOR UNEVENLY LOADED VEHICLE</b>	
<ul style="list-style-type: none"> <li>• Visually check the vehicle for an uneven loading condition.</li> <li>• <b>Is the vehicle unevenly loaded?</b></li> </ul>	<p><b>Yes</b> ADVISE the customer of uneven loading condition.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE TIRE PRESSURES AND TIRE CONDITIONS</b>	
<ul style="list-style-type: none"> <li>• Check the tire pressures. Refer to the Vehicle Certification (VC) label located on the driver door jamb. Check the tires for uneven/abnormal wear. Refer to Diagnosis and Testing - Wheels and Tires in <u>Section 204-04</u> .</li> <li>• <b>Are the tire pressures and tire conditions</b></li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> ADJUST the tire pressures to the specified pressure or INSTALL new tires as necessary.</p>

OK?	
<b>A3 ISOLATE TIRE DRIFT/PULL CONDITION</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</li> <li>• Cross the front wheel and tire assemblies from left-to-right. Refer to <u>Section 204-04</u> .</li> <li>• <b>Does the vehicle drift/pull?</b></li> </ul>	<p><b>Yes</b> If the vehicle drifts/pulls in the opposite direction, tire forces are causing the drift/pull. REFER to <u>Section 204-04</u> to diagnose tire drift/pull. If the vehicle drifts/pulls in the same direction, GO to <u>A4</u> .</p> <p><b>No</b> Tire forces were causing the drift/pull and the concern has been corrected.</p>
<b>A4 CHECK FOR BRAKE DRAG</b>	
<ul style="list-style-type: none"> <li>• Spin all 4 wheel and tire assemblies by hand and check for brake drag.</li> <li>• <b>Do the wheels spin freely?</b></li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> REFER to <u>Section 206-00</u> to diagnose brake drag condition.</p>
<b>A5 CHECK THE WHEEL ALIGNMENT</b>	
<ul style="list-style-type: none"> <li>• Using alignment equipment and the manufacturer's instructions, check the wheel alignment.</li> <li>• <b>Is the wheel alignment out of specification?</b></li> </ul>	<p><b>Yes</b> ADJUST the alignment as necessary. REFER to General Procedures in this section.</p> <p><b>No</b> REFER to <u>Section 211-00</u> to diagnose steering system drift/pull/wander condition.</p>
<b>A6 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> .</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for fire suppression system depowering and repowering procedure.</p>

## Component Test

### Ball Joint Inspection

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

1. If equipped, turn the air suspension service switch to the OFF position.

2. Prior to inspecting the ball joints for wear, inspect the wheel bearings. Install new wheel bearings as necessary. Refer to [Section 204-01](#) .
3. **NOTE:** In order to get accurate measurements, the suspension must be in full rebound with the weight of the vehicle supported by the frame.

Raise and support the vehicle by the frame to allow the wheels to hang in the rebound position.

4. Inspect the ball joint and ball joint boot for damage.
  - If the ball joint or ball joint boot is damaged, install a new ball joint as necessary. Refer to [Section 204-01](#) .

**NOTE:** Carry out Steps 5-7 to inspect the lower ball joint. Carry out Steps 8-10 to inspect the upper ball joint.

5. **NOTICE:** Do not use any tools or equipment to move the wheel and tire assembly or suspension components while checking for relative movement. Suspension damage may occur. The use of tools or equipment will also create relative movement that may not exist when using hand force. Relative movement must be measured using hand force only.

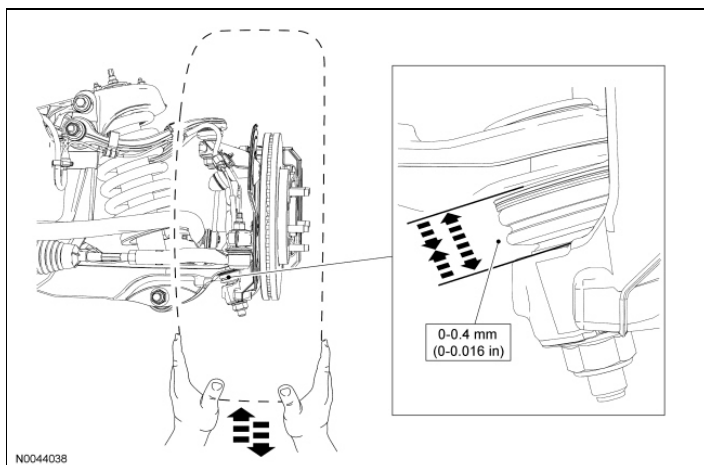
**NOTE:** The weight of the wheel and tire assembly must be overcome to get an accurate measurement on the dial indicator.

Inspect the ball joint for relative movement by alternately pulling downward and pushing upward on the wheel and tire assembly by hand. Note any relative vertical movement between the wheel knuckle and lower arm at the lower ball joint.

- If relative movement is not felt or seen, the ball joint is OK. Do not install a new ball joint.
- If relative movement is found, continue with Step 6.

6. **NOTE:** In order to obtain an accurate measurement, the dial indicator should be aligned as close as possible with the vertical axis (center line) of the ball joint.

To measure ball joint deflection, attach a suitable dial indicator with a flexible arm between the lower control arm and the wheel knuckle or ball joint stud.



7. Measure the ball joint deflection while an assistant pushes up and pulls down on the wheel and tire assembly, by hand.
  - If the deflection exceeds the specification, a new ball joint must be installed. Refer to [Section 204-01](#) .
  - If the deflection meets the specification, continue with the procedure.



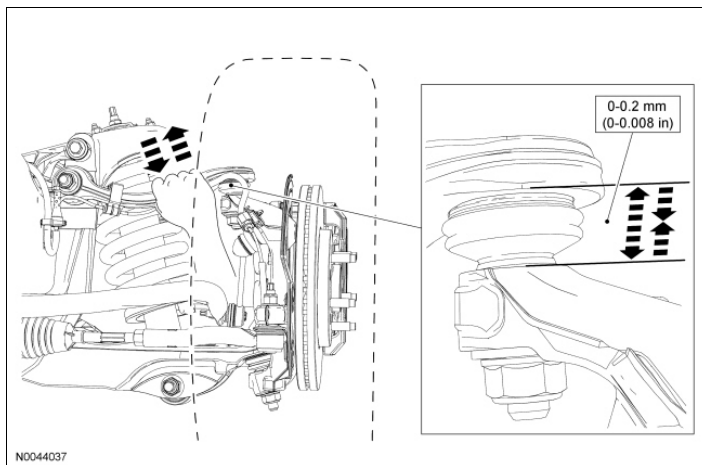
8. **NOTICE:** Do not use any tools or equipment to move the wheel and tire assembly or suspension components while checking for relative movement or suspension damage may occur. The use of tools or equipment will also create relative movement that may not exist when using hand force. Relative movement must be measured using hand force only.

Inspect the ball joint for relative movement by alternately pulling downward and pushing upward on the upper control arm by hand. Note any relative vertical movement between the wheel knuckle and upper arm at the upper ball joint.

- If relative movement is not felt or seen, the ball joint is OK. Do not install a new ball joint.
- If relative movement is found, continue with Step 9.

9. **NOTE:** In order to obtain an accurate measurement, the dial indicator should be aligned as close as possible with the vertical axis of the ball joint.

To measure ball joint deflection, attach a suitable dial indicator with a flexible arm between the upper control arm and the wheel knuckle or ball joint stud.

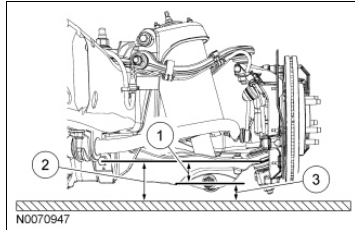


10. Measure the ball joint deflection while an assistant pushes up and then pulls down on the upper control arm, by hand.
- If the deflection exceeds the specification, a new ball joint must be installed. Refer to [Section 204-01](#).
  - If the deflection meets the specification, no further action is required.
11. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#). Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

12. If equipped, turn the air suspension service switch to the ON position.



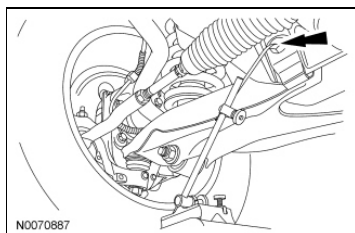
**Ride Height Measurement****Front Ride Height Measurement**

Item	Description
1	Ride height = 1 - 2
2	Measurement 1
3	Measurement 2

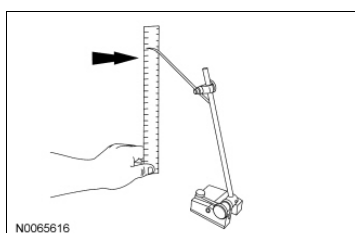
**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

**NOTE:** Make sure that the vehicle is positioned on a flat, level surface and the tires are inflated to the correct pressure. Vehicle should have a full tank of fuel.

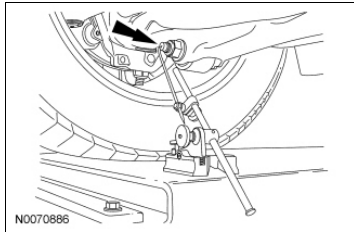
1. Position a suitable surface gauge (such as Starrett 57D Surface Gauge) on a flat, level surface and adjust the gauge arm until the scribe point is located in the center of the lower arm forward mounting bolt.
  - Lock the surface gauge in this position.



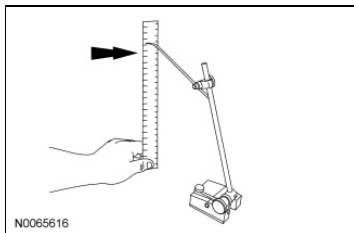
2. With the surface gauge positioned on a flat, level surface, record the measurement of the surface gauge position (measurement 1).



3. Position the surface gauge on the same flat, level surface as used in Step 1 and adjust the gauge arm until the scriber point is located in the center of the shock absorber mounting bolt.
  - Lock the surface gauge in this position.



4. With the surface gauge positioned on a flat, level surface, record the measurement of the surface gauge position (measurement 2).

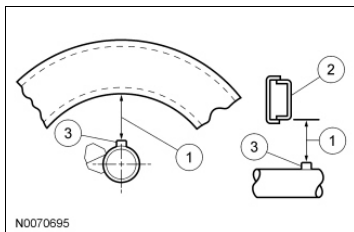


5. Subtract measurement 2 from measurement 1 to obtain the front ride height.
  - Refer to Specifications in this section.

6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.


### Rear Ride Height Measurement



Item	Description
1	Ride height
2	Inner frame reinforcement
3	Rear axle jounce stop

**⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

**NOTE:** Make sure that the vehicle is positioned on a flat, level surface and the tires are inflated to the correct pressure. Vehicle should have a full tank of fuel.

1. Measure the distance between the inner frame reinforcement (Item 2) and the rear axle jounce stop (Item 3) to obtain the rear ride height (Item 1).
2.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Camber and Caster Adjustment

### Camber

1. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

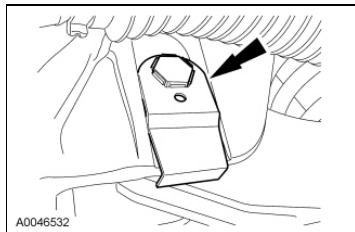
If equipped, turn the air suspension service switch to the OFF position.

2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.

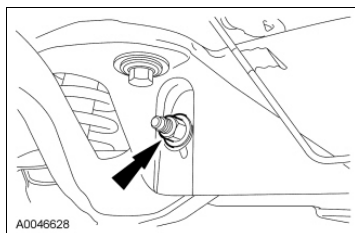
Using alignment equipment and the manufacturer's instructions, measure the camber and caster settings.

3. **NOTE:** Camber adjustment can effect caster and toe settings.

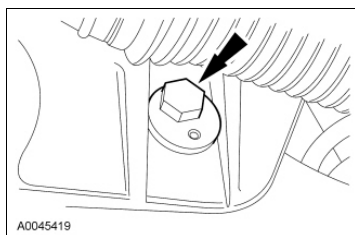
If necessary, remove and discard the cam bolt retainer flag.



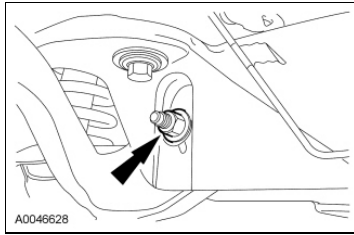
4. Loosen the cam bolt nut.



5. Rotate the cam bolt to adjust camber.



6. While holding the cam bolt, tighten the nut to 238 Nm (176 lb-ft).



7. Recheck the camber, caster and toe and adjust as needed.

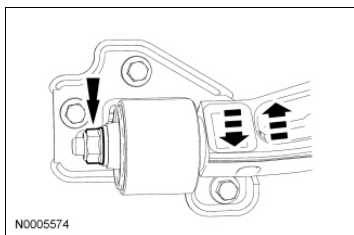
## Caster

8. **NOTE:** Caster adjustment can effect camber and toe settings.

**NOTE:** The LH caster bushing may have a centering washer that needs to be removed and discarded prior to adjustment.

Loosen the rearward lower arm bushing-to-lower arm nut and move the lower arm inward to decrease the caster and outward to increase the caster.

- Snug the retaining nut.



9. Recheck the camber, caster and toe and adjust as needed.
  10. **NOTICE:** Do not tighten the bushing retaining nut until the weight of the vehicle is resting on the wheel and tire assemblies or damage to the bushing may occur.
- While holding the lower arm, tighten the lower arm bushing-to-lower arm nut to 175 Nm (128 lb-ft).
11. Recheck the camber, caster and toe and adjust as needed.
  12. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

13. If equipped, turn the air suspension service switch to the ON position.





## Toe Adjustment

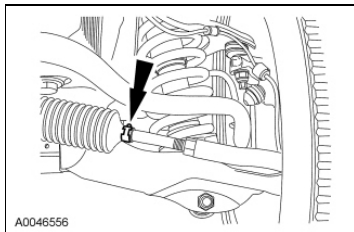
1. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

If equipped, turn the air suspension service switch to the OFF position.

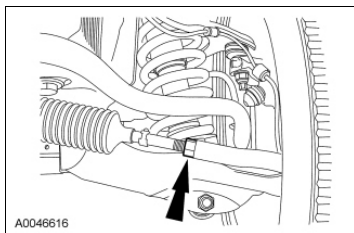
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Using alignment equipment and the manufacturer's instructions, measure the toe settings.

3. Start the engine and center the steering wheel.
4. Turn the engine OFF, and hold the steering wheel in the "straight-ahead" position using a suitable holding device.
5. Remove the clamps.

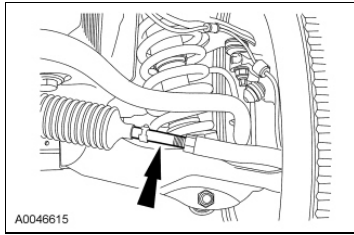


6. Loosen the outer tie-rod jam nuts.
  - Clean and lubricate the nuts and the tie-rod end threads.



7. **NOTICE:** Do not allow the bellows boot to twist when the tie rod is rotated or damage to the boot may occur.

Rotate the tie rods to obtain the correct toe setting.



8. Start the engine and recenter the steering wheel.
    - Recheck the toe settings and adjust if necessary.
  9. Tighten the tie-rod jam nuts and install the clamps.
    - Tighten to 55 Nm (41 lb-ft).
  10. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.
  11. If equipped, turn the air suspension service switch to the ON position.
-

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>
Brake caliper anchor plate bolts	160	118
Lower arm bushing bracket-to-frame bolts	90	66
Lower arm-to-crossmember nut and cam bolt	235	173
Lower ball joint nut	150	111
Lower control arm bushing nut	175	128
Outer tie-rod end nut	80	59
Shock absorber lower nut	235	173
Shock absorber upper mount nuts	30	22
Shock rod nut	50	37
Stabilizer bar bracket nuts	63	46
Stabilizer bar link lower nuts	55	41
Stabilizer bar link upper nuts	63	46
Steering gear crossmember studs	30	22
Steering gear-to-crossmember stud nuts	103	76
Upper arm-to-crossmember nuts and bolts	150	111
Upper ball joint nut	150	111
Wheel bearing and wheel hub bolts	120	89

## Front Suspension

The front suspension system utilizes an upper and lower arm and is an independent suspension design. This type of suspension uses 2 parallel arms. Each arm has 2 mounting positions to the chassis and one ball joint attachment at the wheel knuckle. The shock absorber mounts to the lower arm and along with the spring, controls vertical movement. A stabilizer bar and links are included to control suspension lean/sway during turns. Double-arm designs allow for carefully controlled motion of the wheel throughout suspension travel, controlling such parameters as camber angle, caster angle and toe.

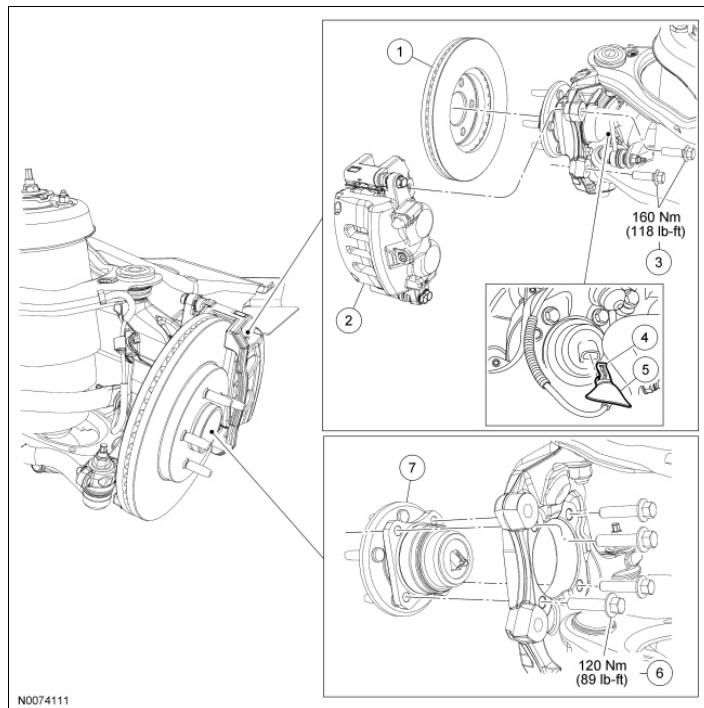
The front suspension system consists of the following:

- Lower arms
  - Shock absorber and spring assembly
  - Stabilizer bar and links
  - Upper arms
  - Wheel bearing and wheel hub assembly
  - Wheel knuckle
  - Wheel studs
-

## **Front Suspension**

Refer to Section 204-00 .

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**Wheel Bearing and Wheel Hub**

Item	Part Number	Description
1	1125	Brake disc
2	2B120 LH/ 2B121 RH	Brake caliper
3	W707589	Brake caliper anchor plate bolts (2 required)
4	-	Wheel speed sensor electrical connector (part of 2C204)
5	-	Wheel speed sensor electrical connector rubber splash shield (part of 2C204)
6	W709529	Wheel bearing and wheel hub bolt
7	1104	Wheel bearing and wheel hub

**Removal and Installation**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

2. **NOTICE:** Do not allow the caliper and anchor plate to hang from the brake hose or damage to the hose may occur.

Remove the bolts and position the caliper and anchor plate assembly aside.

- Support the caliper and anchor plate assembly using mechanic's wire.
- To install, tighten to 160 Nm (118 lb-ft).

3. Remove the brake disc.

4. Peel back the rubber splash shield and disconnect the wheel speed sensor electrical connector.


5. Remove and discard the bolts and the wheel bearing and wheel hub.

- To install, tighten the new bolts to 120 Nm (89 lb-ft).

6. **NOTICE:** To avoid sensor or wiring damage, be sure to correctly route the wheel speed sensor wiring in front of the stabilizer bar link.

**NOTE:** During reassembly, verify that the wheel speed sensor electrical connector is fully seated with an audible click, and that the rubber splash shield is positioned back into place.

To install, reverse the removal procedure.

7.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

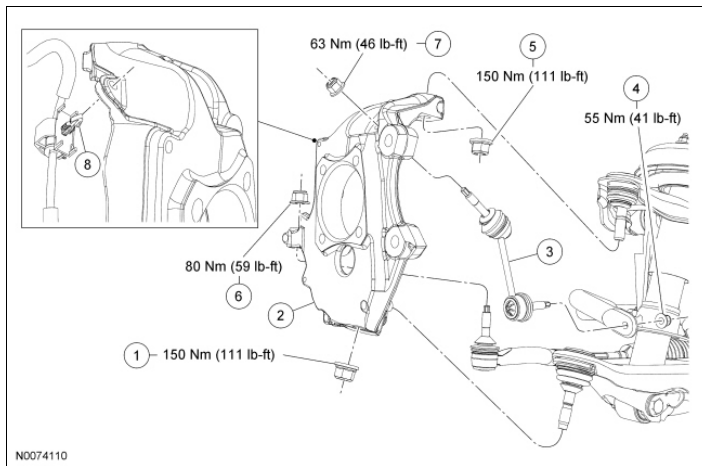
If equipped with a fire suppression system, repower the system.

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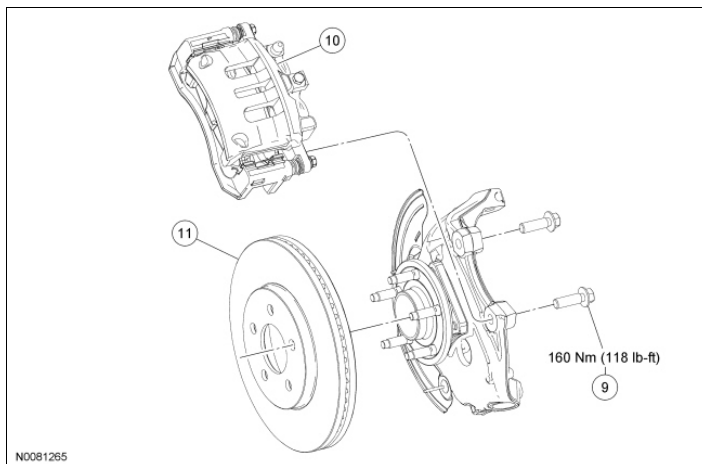
## SECTION 204-01: Front Suspension REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

### Wheel Knuckle



Item	Part Number	Description
1	W710298	Lower ball joint nut
2	3K170 RH/ 3K171 LH	Wheel knuckle
3	3B438	Stabilizer bar link
4	W520213	Stabilizer bar link lower nut
5	W710298	Upper ball joint nut
6	W520214	Outer tie-rod end nut
7	W520213	Stabilizer bar link upper nut
8	-	Wheel speed sensor wiring harness retainer (part of 2C204)



Item	Part Number	Description
9	W707589	Brake caliper anchor plate bolt (2 required)
10	-	Brake caliper and anchor plate assembly
11	1125	Brake disc

### Removal and Installation



**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to Section 204-04 .

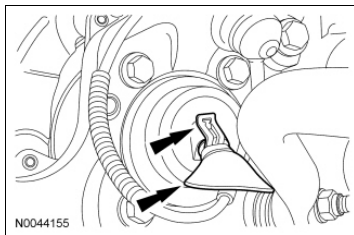
2. **NOTICE:** Do not allow the caliper and anchor plate to hang from the brake hose or damage to the hose may occur.

Remove the bolts and position the caliper and anchor plate assembly aside.

- Support the caliper and anchor plate assembly using mechanic's wire.
- To install, tighten to 160 Nm (118 lb-ft).

3. Remove the brake disc.

4. Pull back the rubber splash shield and disconnect the wheel speed sensor electrical connector.



5. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove the nut and detach the outer tie rod from the wheel knuckle.

- To install, tighten to 80 Nm (59 lb-ft).

6. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove and discard the stabilizer bar link upper nut.

- To install, tighten the new nut to 63 Nm (46 lb-ft).

7. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove the stabilizer link lower nut and the stabilizer bar link.

- Discard the nut.
- To install, tighten the new nut to 55 Nm (41 lb-ft).

8. Detach the wheel speed sensor wiring harness retainer from the steering knuckle.

9. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove and discard the upper ball joint nut.

- To install, tighten the new nut to 150 Nm (111 lb-ft).

10. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove the lower ball joint nut and then remove the wheel knuckle.


- Discard the nut.
- To install, tighten the new nut to 150 Nm (111 lb-ft).

11. If necessary, remove the 4 bolts and the wheel bearing and wheel hub.

- Discard the bolts.
- To install, tighten the new bolts to 120 Nm (89 lb-ft).

12. To install, reverse the removal procedure.

13. Check and, if necessary, align the front end. For additional information, refer to Section 204-00 .


14.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

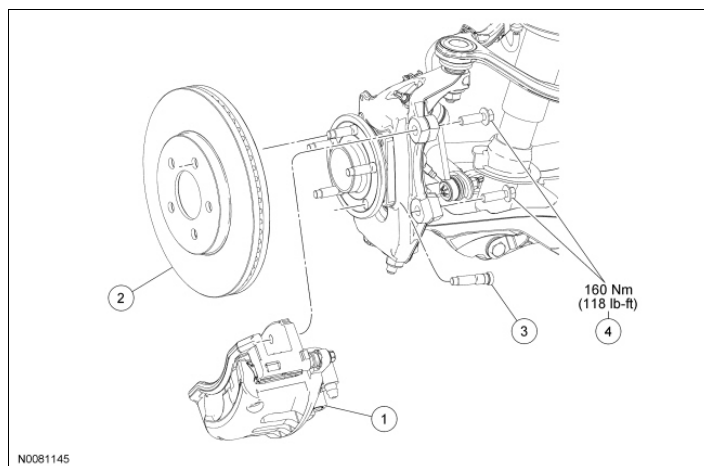
If equipped with a fire suppression system, repower the system.

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## Wheel Studs

### Special Tool(s)

 ST1494-A	C-Frame and Screw Assembly 211-023 (T74P-3044-A1)
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Item	Part Number	Description
1	1125	Brake disc
2	2B120 LH/ 2B121 RH	Disc brake caliper
3	W707287-S	Wheel stud
4	W707589	Brake caliper anchor plate bolts (2 required)

### Removal

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

2. **NOTICE:** Do not allow the caliper and anchor plate assembly to hang from the brake hose or damage to the hose may occur.

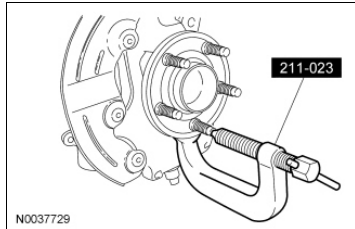
Remove the bolts and position the caliper and anchor plate assembly aside.

- Support the caliper and anchor plate assembly using mechanic's wire.

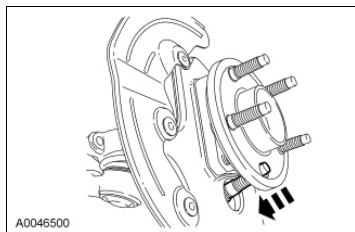
3. Remove the brake disc.

4. **NOTE:** Make sure that the wheel stud being removed is positioned near the access hole on the wheel knuckle prior to installing the C-Frame and Screw Assembly.

Using the C-Frame and Screw Assembly, press the wheel stud out of the wheel hub flange.



5. Remove the wheel stud.

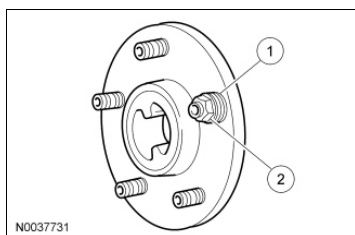


## Installation

1. **NOTE:** Make sure to use washers that have an ID that is larger than the OD of the wheel stud serrations. Use enough washers (approximately 4) to allow the wheel stud to fully seat against the hub flange.

Install the wheel stud.

1. Install 4 washers onto the wheel stud.
2. Install the wheel nut. Tighten the wheel nut until the wheel stud seats fully onto the wheel hub flange.



2. Remove the wheel nut and washers.

3. Install the brake disc.

4. Position the caliper and anchor plate assembly onto the steering knuckle, and install the bolts.

- To install, tighten to 160 Nm (118 lb-ft).

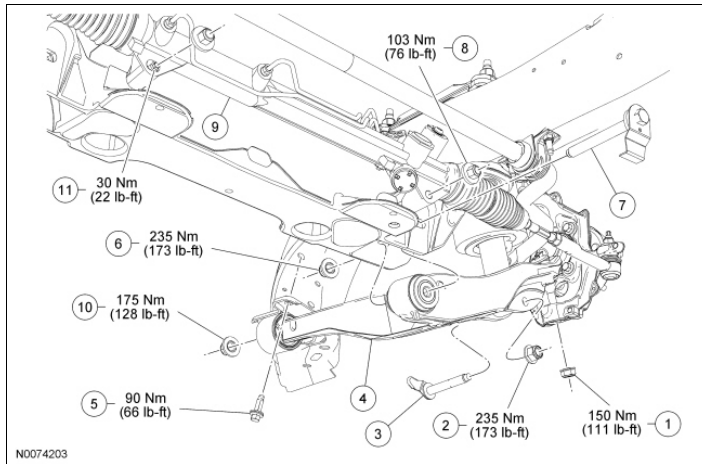
5. Install the wheel and tire. For additional information, refer to [Section 204-04](#).

6. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
For important safety warnings and procedures, refer to [Section 100-02B](#). Failure to follow these

**instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

**Lower Arm**

Item	Part Number	Description
1	W710298	Lower ball joint nut
2	W520216	Shock absorber lower nut
3	3C177	Shock absorber lower flag bolt
4	3042 RH/ 3051 LH	Lower arm
5	W708601	Lower arm bushing bracket bolt (3 required)
6	W708329	Lower arm cam bolt nut
7	3C289	Lower arm cam bolt
8	W707492	Steering gear nut (2 required)
9	3504	Steering gear
10	W710430	Lower arm bushing nut
11	W707972	Steering gear stud (2 required)

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#).

2. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove and discard the lower ball joint nut.

3. Remove and discard the shock absorber lower nut and the flag bolt.

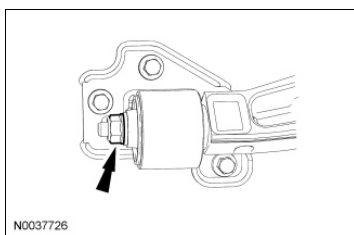
4. **NOTICE:** Do not remove the cam bolt at this time or damage to the steering bellows boot will result.

Remove and discard the lower arm cam bolt nut.


5. Remove and discard the 3 lower arm bushing bracket bolts.
6. Remove and discard the 2 steering gear-to-crossmember stud nuts.
7. Remove the steering gear crossmember studs and move the steering gear upward to access the cam bolt.
8. Remove the cam bolt and the lower arm.
  - Discard the cam bolt.

### Installation

1. Position the lower arm and loosely install the new cam bolt and nut.
2. Position the steering gear and install the gear crossmember studs.
  - Tighten to 30 Nm (22 lb-ft).
3. Install the 2 new steering gear-to-crossmember nuts.
  - Tighten to 103 Nm (76 lb-ft).
4. Install the 3 new lower arm bushing bracket bolts.
  - Tighten to 90 Nm (66 lb-ft).
5. Loosely install the new lower arm cam nut.
6. Loosely install the new shock absorber lower nut and flag bolt.
7. Install the new lower ball joint nut.
  - Tighten to 150 Nm (111 lb-ft).
8. Install the wheel and tire. For additional information, refer to [Section 204-04](#) .
9. With the weight of the vehicle on the wheel and tire assemblies, tighten the lower arm cam bolt and nut to 235 Nm (173 lb-ft).
10. With the weight of the vehicle on the wheel and tire assemblies, tighten the shock absorber lower nut to 235 Nm (173 lb-ft).
11. If a new lower control arm is being installed, tighten the new bushing nut to 175 Nm (128 lb-ft).



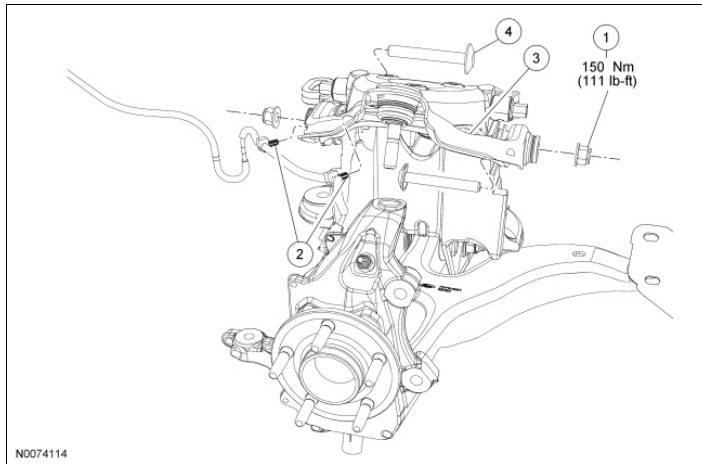
12. Check and if necessary, align the front end. For additional information, refer to [Section 204-04](#) .

13.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---



**Upper Arm**

Item	Part Number	Description
1	W520215	Upper arm nut (2 required)
2	-	Wheel speed sensor harness retainers (2 required)
3	3084 RH/ 3091 LH	Upper arm
4	3A358	Upper arm bolt (2 required)

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.


1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

2. Detach the wheel speed sensor retainers from the upper arm.
3. Remove the 2 nuts, 2 bolts and the upper arm.
  - Discard the nuts and bolts.

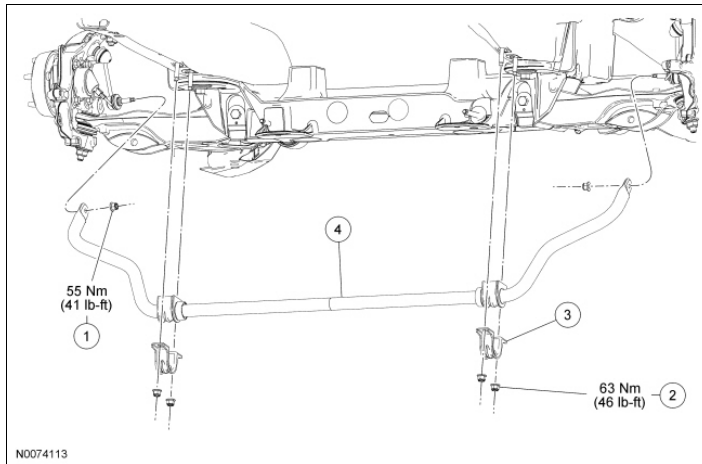
**Installation**

1. Position the upper arm and loosely install the 2 new bolts and nuts.
2. Attach the wheel speed sensor retainers to the upper arm.
3. Install the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

4. Install the wheel and tire. For additional information, refer to Section 204-04 .
5. With the weight of the vehicle on the wheel and tire assemblies, tighten the 2 new upper arm nuts to 150 Nm (111 lb-ft).
6. Check and if necessary, align the front end. For additional information, refer to Section 204-00 .
7.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

**Stabilizer Bar**

Item	Part Number	Description
1	W520213	Lower stabilizer bar link nut (2 required)
2	W520213	Stabilizer bar bracket nut (4 required)
3	4A407	Stabilizer bar bracket (2 required)
4	5482	Stabilizer bar

**Removal and Installation**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove the 2 lower nuts and disconnect the stabilizer bar links from the stabilizer bar.

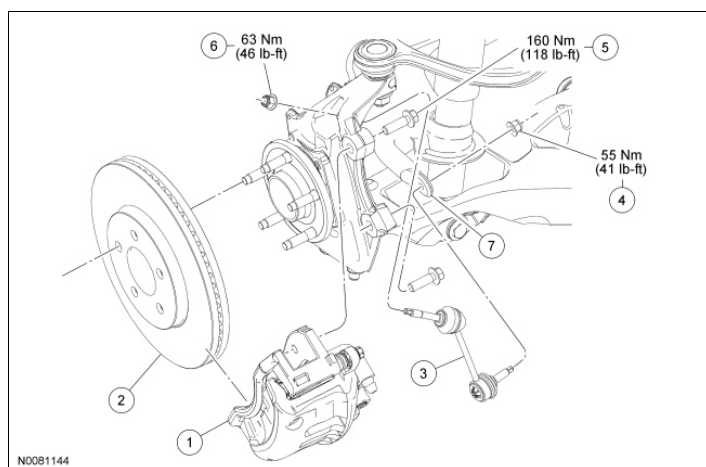
- Discard the nuts.
- To install, tighten the new nuts to 55 Nm (41 lb-ft).

3. Remove the 4 nuts, the 2 brackets and the stabilizer bar.
  - Discard the nuts.
  - To install, tighten the new nuts to 63 Nm (46 lb-ft).

4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure.

5. If equipped with a fire suppression system, repower the system.
-

**Stabilizer Bar Link**

Item	Part Number	Description
1	2B120 LH/ 2B121 RH	Brake caliper
2	1125	Brake disc
3	3B438	Stabilizer bar link
4	W520213	Stabilizer bar link lower nut
5	W707589	Brake caliper anchor plate bolt (2 required)
6	W520213	Stabilizer bar link upper nut
7	5A771	Stabilizer bar

**Removal and Installation**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

2. **NOTICE:** Do not allow the caliper and anchor plate assembly to hang from the brake hose or damage to the hose may occur.

Remove the bolts and position the caliper, pads and anchor plate assembly aside.

- Support the caliper and anchor plate assembly using mechanic's wire.
- To install, tighten to 160 Nm (118 lb-ft).

3. Remove the brake disc.

4. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.


Remove the stabilizer link upper nut.

- Discard the nut.
- To install, tighten the new nut to 63 Nm (46 lb-ft).

5. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove the stabilizer link lower nut and the stabilizer bar link.

- Discard the nut.
- To install, tighten the new nut to 55 Nm (41 lb-ft).

6.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**



To install, reverse the removal procedure.

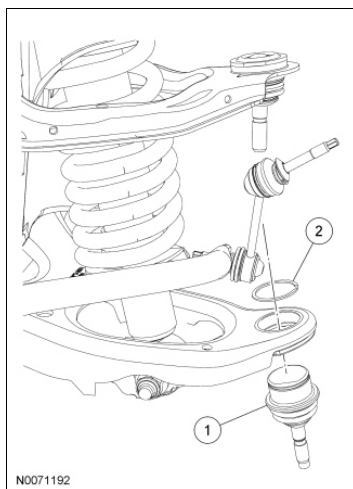
7. If equipped with a fire suppression system, repower the system.

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**Ball Joint - Lower**

## Special Tool(s)

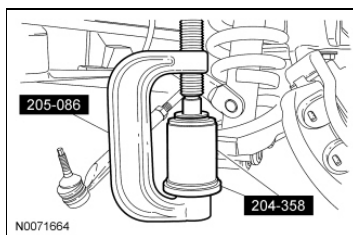
 ST2929-A	Installer/Remover, Ball Joint 204-358
 ST1172-A	Installer/Remover, C-Frame and Screw 205-086



Item	Part Number	Description
1	3050	Lower ball joint
2	-	Lower ball joint snap ring (part of 3050 kit)

**Removal**

1. Remove the wheel knuckle. For additional information, refer to Wheel Knuckle in this section.
2. Remove and discard the lower ball joint snap ring.
3. Using the C-Frame and Screw Installer/Remover and Ball Joint Installer/Remover, remove the lower ball joint.

**Installation**

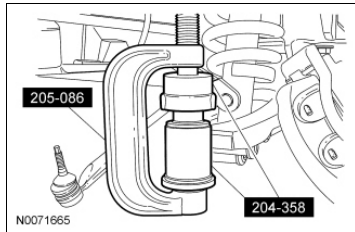
1. **NOTICE:** Do not damage the lower ball joint boot when installing the ball joint or premature

**failure of the ball joint may occur.**

**NOTE:** Make sure the ball joint snap ring is fully seated.

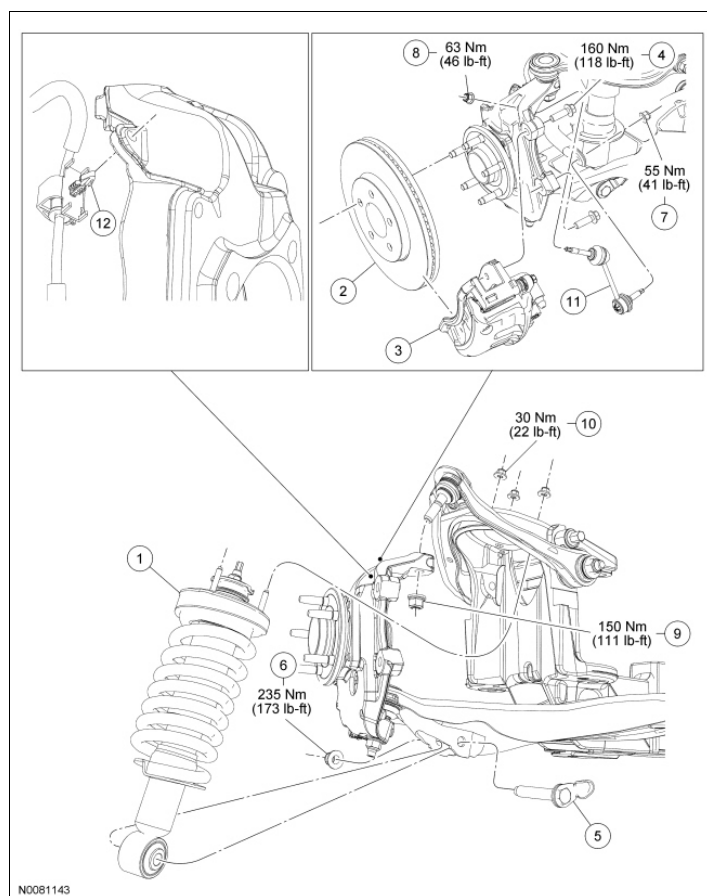
Using the C-Frame and Screw Installer/Remover and Ball Joint Installer/Remover, install the lower ball joint.

- Install the ball joint snap ring.



2. Install the wheel knuckle. For additional information, refer to Wheel Knuckle in this section.
-



**Shock Absorber and Spring Assembly**

Item	Part Number	Description
1	18045/5310	Shock absorber/coil spring assembly
2	1125	Brake disc
3	2B120	Brake caliper and anchor plate
4	W707589	Brake caliper anchor plate bolt (2 required)
5	3C177	Shock absorber lower flag bolt
6	W520216	Shock absorber lower nut
7	W520213	Lower stabilizer bar link nut
8	W520213	Upper stabilizer bar link nut
9	W710298	Upper ball joint nut
10	W700390	Shock absorber mounting bracket nut (3 required)
11	3B438	Stabilizer bar link
12	-	Wheel speed sensor wiring harness retainer (part of 2C204)

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make

sure correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to **Section 204-04** .

2. **⚠ WARNING:** Do not remove the shock absorber center nut. Removal of this nut releases the spring tension and may result in serious personal injury.

Remove and discard the 3 shock absorber upper mount nuts.

3. **NOTICE:** Do not allow the caliper and anchor plate assembly to hang from the brake hose or damage to the hose may occur.

Remove the 2 bolts and position the caliper, pads and anchor plate assembly aside.

- Support the caliper and anchor plate assembly using mechanic's wire.

4. Remove the brake disc.

5. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove and discard the stabilizer bar upper link nut.

6. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove and discard the stabilizer bar link lower nut and the stabilizer bar link.

7. Detach the wheel speed sensor wiring harness retainer from the wheel knuckle.

8. **NOTE:** Use the hex-holding feature to prevent the stud from turning while removing the nut.

Remove and discard the upper ball joint nut.

9. Remove and discard the shock absorber lower nut and flag bolt.

10. Remove the shock absorber and spring assembly.

## Installation

1. **NOTE:** Do not tighten the nut at this time.


Install the shock absorber and spring assembly and loosely install the new lower nut and flag bolt.

2. Install the new upper ball joint nut and tighten to 150 Nm (111 lb-ft).

3. Attach the wheel speed sensor wiring harness to the wheel knuckle.

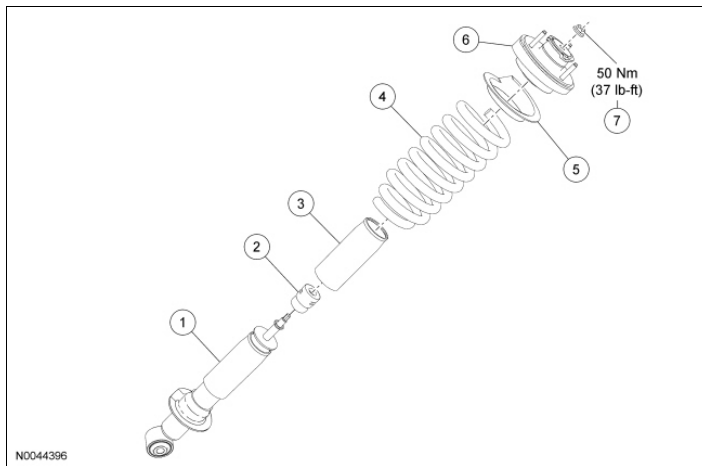
4. Position the stabilizer bar link and install the 2 new nuts.

- Tighten the lower nut to 55 Nm (41 lb-ft).
- Tighten the upper nut to 63 Nm (46 lb-ft).

5. Install the brake disc.
6. Position the brake caliper and anchor plate assembly and install the 2 anchor plate bolts.
  - Tighten to 160 Nm (118 lb-ft).
7. Install the wheel and tire. For additional information, refer to Section 204-04 .
8. Install the 3 new shock absorber upper mount nuts.
  - Tighten to 30 Nm (22 lb-ft).
9. With the weight of the vehicle on the wheel and tire assemblies, tighten the shock absorber lower nut to 235 Nm (173 lb-ft).
10.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Shock Absorber and Spring Assembly**

Item	Part Number	Description
1	18045	Shock absorber
2	-	Jounce bumper
3	-	Dust boot
4	5310	Coil spring
5	5415	Coil spring insulator
6	18183	Shock absorber mounting bracket
7	W520114	Shock rod nut

**Disassembly**

**⚠ WARNING:** Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Do not remove the shock absorber center nut. Removal of this nut releases the spring tension and may result in serious personal injury.

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New parts must be installed with the same part numbers or equivalent part, if replacement is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure correct retention of these parts.

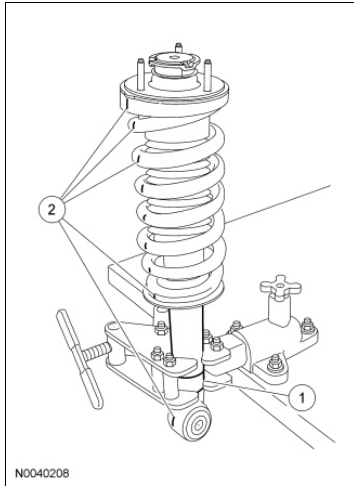
- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Remove the shock absorber and spring assembly. For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.

**2. NOTICE: Overtightening the vise may damage the shock absorber tube.**

Mount and mark the shock absorber and spring assembly.

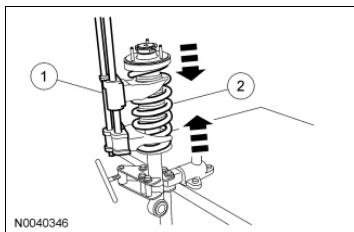
1. Position the shock absorber and spring assembly in a suitable holding device.
2. Mark the upper mounting bracket, spring and shock absorber for assembly reference.



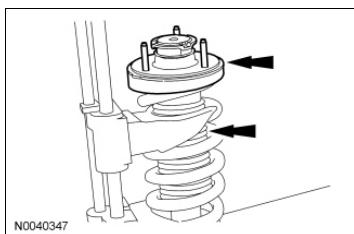
3. **NOTE:** If installing a new spring, make sure the part number is correct. Refer to the Vehicle Certification (VC) label for the correct spring code. For additional information, refer to [Section 100-01](#) to convert the spring code to a part number.

Compress the spring.

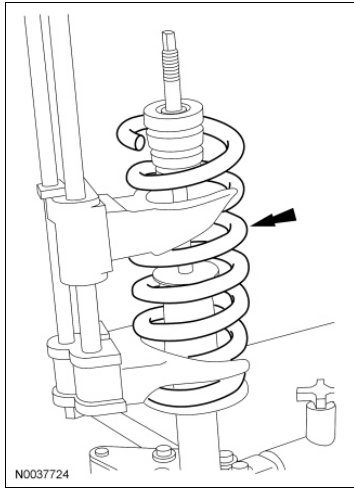
1. Install an appropriate spring compressor.
2. Compress the spring.



4. While holding the shock absorber rod, remove and discard the nut.
5. Remove the mounting bracket and dust boot as an assembly.



6. Carefully remove the spring and spring compressor.



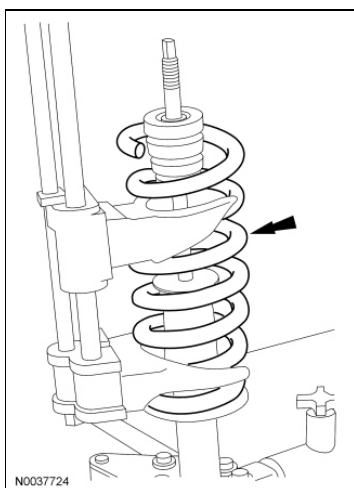
### Assembly

**NOTE:** If a new shock absorber, spring or upper mount is installed, the new part should be marked in the same place as the old part to make sure the assembly is correctly aligned.


1. Inspect the lower and upper spring seats for damage.
2. Inspect the spring insulator for wear or damage. Install a new mounting bracket if necessary.
3. **NOTE:** If installing a new spring, make sure the part number is correct. Refer to the VC label for the correct spring code. For additional information, refer to Section 100-01 to convert the spring code to a part number.

Inspect the spring for nicked or scratched paint. If the paint is nicked or scratched, install a new spring.

4. If removed, place the shock absorber into the vise.
5. Position the shock and spring compressor onto the strut.



6. Position the mounting bracket and dust boot onto the spring. Make sure the marks made during Disassembly, Step 3, are lined up.
7. Install a new shock rod nut.
  - To install, tighten to 50 Nm (37 lb-ft).

8. Remove the spring compressor.
9. Install the shock absorber and spring assembly. For additional information, refer to Shock Absorber and Spring Assembly in this section.
10.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Brake caliper guide pin bolts	25	18	-
Height sensor mounting bracket nut (inner)	11	-	97
Height sensor mounting bracket nut (outer)	12	-	106
Lateral arm-to-frame nuts and bolts	90	66	-
Lateral arm-to-Watts link pivot nut	90	66	-
Lower arm-to-axle nut and bolt	150	111	-
Lower arm-to-frame bolt and flagnut	150	111	-
Lower shock bolt and nut	90	66	-
Stabilizer bar bracket bolt	30	22	-
Stabilizer bar link nut	20	-	177
Upper arm-to-axle bolt and flagnut	90	66	-
Upper arm-to-frame bolt and flagnut	150	111	-
Upper shock nut	40	30	-
Watts link pivot nut	250	184	-
Watts link pivot stud	270	199	-
Wheel speed sensor bolt	7	-	62



## Rear Suspension

**NOTE:** If the Watts link pivot stud or nut is loosened, a new Watts link pivot stud and nut service kit must be installed.

The rear suspension consists of the following components:

- Lateral arms
- Lower arms
- Shock absorbers
- Springs
- Stabilizer bar, links and bushings
- Upper arms
- Watts link pivot
- Wheel studs

The rear suspension comprises 4 suspension arms, 2 shock absorbers, 2 springs, a stabilizer bar and a Watts link assembly.

The rear suspension arms limit the forward and rearward movement of the rear axle in relation to the frame. Each rear spring is mounted to an upper seat integral with the frame and a lower seat welded to the rear axle housing. To reduce noise and vibration, a rubber isolator is placed between the axle and the spring and another between the spring and frame.

The Watts link assembly is connected between the rear axle differential housing and the frame. The Watts link assembly controls the side-to-side sway of the vehicle.

The rear stabilizer bar and links assembly aids in the control of the suspension travel and restricts body roll.

The rear shock absorbers provide motion and force damping of the rear suspension during suspension travel, jounce and rebound.

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## **Rear Suspension**

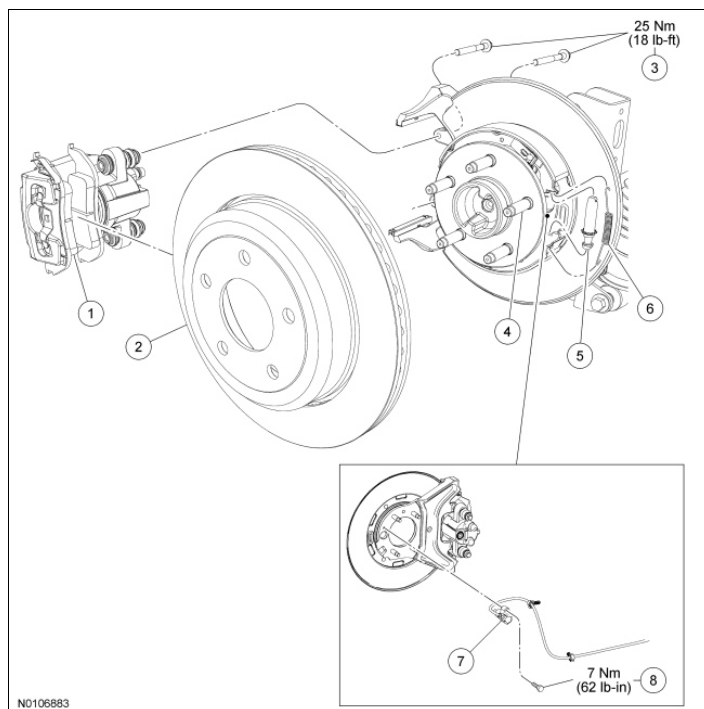
Refer to Section 204-00 .

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**Wheel Studs**

## Special Tool(s)

 ST1494-A	C-Frame and Screw 211-023 (T74P-3044-A1)
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Item	Part Number	Description
1	-	Brake caliper and pad assembly
2	2C026	Brake disc
3	W500516	Caliper bolts (2 required)
4	1107	Wheel stud
5	-	Parking brake adjuster (part of 2A225)
6	-	Parking brake shoe adjuster spring (part of 2A225)
7	2C190	Wheel speed sensor
8	W707231	Wheel speed sensor bolt

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners with the same part number or an equivalent part must be installed if installation is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may

**result in serious personal injury.**

Remove the wheel and tire. For additional information, refer to [Section 204-04](#).

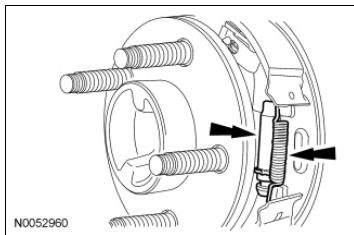
**2. NOTICE: Do not allow the brake caliper assembly to hang from the brake hose or damage to the hose may occur.**

Remove the bolts and position the brake caliper aside.

- Support the caliper assembly using mechanic's wire.

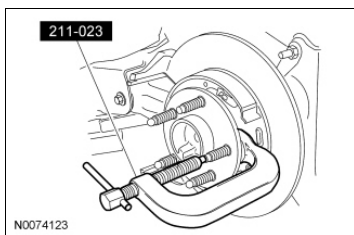
3. Remove the brake disc.

4. Remove the spring and the adjuster from the rear parking brake shoes.



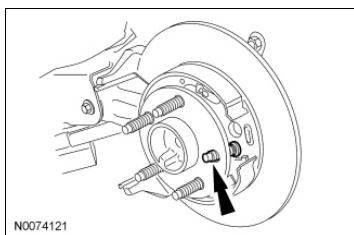
5. Remove the wheel speed sensor bolt and position aside the sensor.

6. Using the C-Frame and Screw, press the wheel stud from its seat.



7. Rotate the flange so that the tip of the wheel stud is pointing upwards and remove the wheel stud.

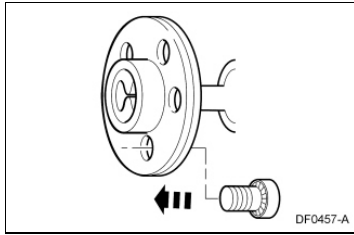
- Discard the wheel stud.



## Installation

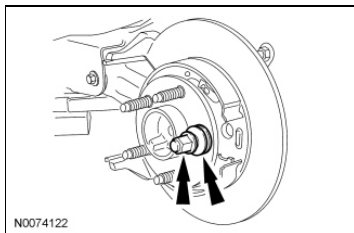
**NOTICE: Never use air tools to install wheel studs. The serrations may be stripped from the stud.**

1. Insert a new wheel stud in the hole in the axle flange, making sure the serrations are aligned with those made by the original wheel stud.



2. **NOTE:** Make sure to use washers that have an ID that is larger than the OD of the wheel stud serrations. Use enough washers (approximately 4) to allow the wheel stud to fully seat against the hub flange.

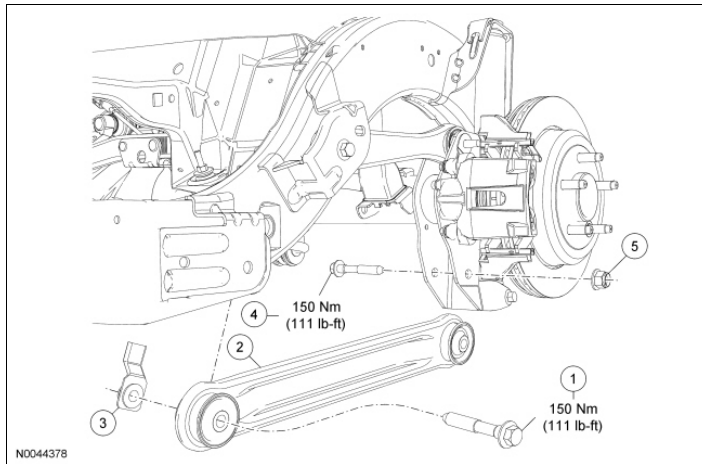
Place 4 flat washers over the outside end of the wheel stud, and thread a standard wheel nut with the flat side against the washers.



3. Tighten the wheel nut until the wheel stud head seats against the back side of the axle flange.
4. Remove the wheel nut and washers.
5. Install the brake disc.
6. Position the brake caliper and install the bolts.
  - Tighten to 25 Nm (18 lb-ft).
7. Position the wheel speed sensor and install the bolt.
  - Tighten to 7 Nm (62 lb-in).
8. Install the wheel and tire. For additional information, refer to [Section 204-04](#) .
9. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



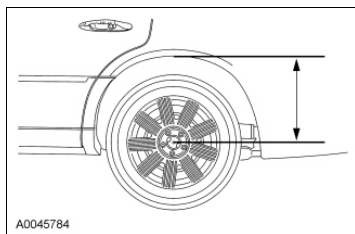
**Lower Arm**

Item	Part Number	Description
1	W704665	Lower arm-to-frame bolt
2	5538	Lower arm
3	W705543	Lower arm-to-frame flagnut
4	W704665	Lower arm-to-axle bolt
5	W520215	Lower arm-to-axle nut

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners must be installed with the same part number or an equivalent part if installation is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts. Orientation of the fasteners is also important on all rear suspension arms. Make sure the fasteners are installed in the same direction as they were in when removed.

1. For reference during the installation procedure, measure the distance from the lip of the fender to the center of the wheel hub with the vehicle in a static level ground position.



2. **⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to **Section 204-04**.

3. Remove and discard the lower arm-to-axle nut and bolt.



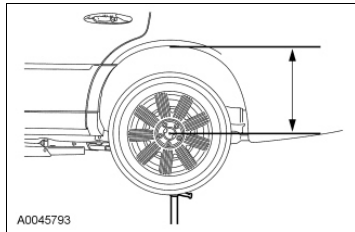
4. Remove the lower arm-to-frame bolt, flagnut and the lower arm.
  - Discard the flagnut and bolt.

### Installation

1. **NOTE:** The rear suspension lower arms are interchangeable from side-to-side, with OUTBOARD stamped on one side of the arms for positioning during installation.

Position the lower arm and loosely install the new lower arm-to-frame bolt and flagnut.

2. Loosely install the new lower arm-to-axle nut and bolt.

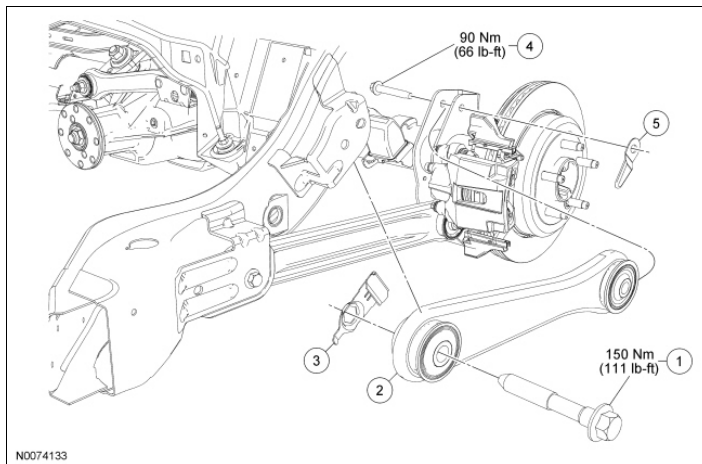


3. Before tightening the fasteners, use a suitable jack to raise the suspension until the distance between the lip of the fender and the center of the wheel hub is equal to the measurement taken in the removal procedure.
4. Tighten the lower arm-to-frame nut to 150 Nm (111 lb-ft).
5. Tighten the lower arm-to-axle nut to 150 Nm (111 lb-ft).
6. Install the wheel and tire. For additional information, refer to Section 204-04 .
7. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
**For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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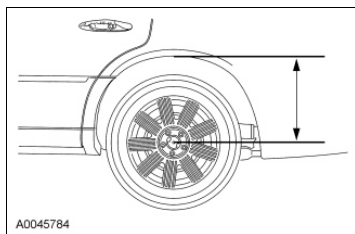
**Upper Arm**

Item	Part Number	Description
1	W704665	Upper arm-to-frame bolt
2	5501	Upper arm
3	W707060	Upper arm-to-frame flagnut
4	W506545	Upper arm-to-axle bolt
5	W704662	Upper arm-to-axle nut

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners with the same part number or an equivalent part must be installed if installation is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts. Orientation of the fasteners is also important on all rear suspension arms. Make sure the fasteners are installed in the same direction as they were in when removed.

1. For reference during the installation procedure, measure the distance from the lip of the fender to the center of the wheel hub with the vehicle in a static level ground position.



2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to **Section 204-04** .

3. **NOTICE:** Do not use excessive force when removing the pivot bolt and flagnut on the right upper suspension arm-to-axle bracket. Damage to the brake line may occur.

Remove and discard the upper arm-to-axle bolt and flagnut.

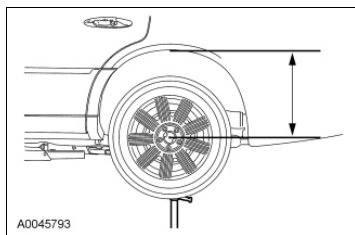
4. Remove the upper arm-to-frame bolt and the upper arm.
- Discard the nut and bolt.

### Installation

1. **NOTE:** The rear suspension upper arms are interchangeable from side-to-side, with FRONT and OUTBOARD stamped on the side of the arms for positioning during installation.

Position the upper arm and loosely install the new upper arm-to-frame bolt.

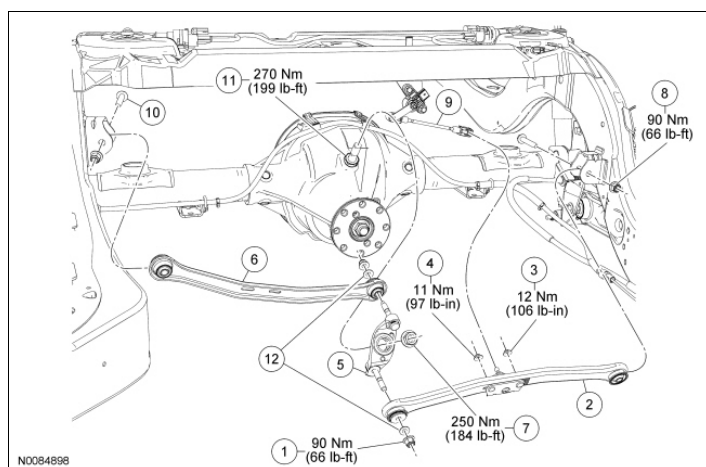
2. Loosely install the new upper arm-to-axle bolt and flagnut.



3. Before tightening the fasteners, use a suitable jack to raise the suspension until the distance between the lip of the fender and the center of the wheel hub is equal to the measurement taken in the removal procedure.
4. Tighten the upper arm-to-frame bolt to 150 Nm (111 lb-ft).
5. Tighten the upper arm-to-axle bolt to 90 Nm (66 lb-ft).
6. Install the wheel and tire. For additional information, refer to Section 204-04 .
7. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



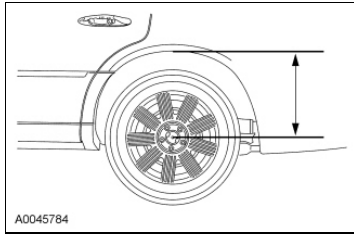
**Lateral Arm and Watts Link Pivot Assembly**

Item	Part Number	Description
1	W520214	Lateral arm-to-Watts link pivot nut (2 required)
2	4264	Lateral arm, LH
3	N803300	Height sensor bracket nut (outer)
4	W700667	Height sensor bracket nut (inner)
5	4264	Watts link pivot
6	4264	Lateral arm, RH
7	W520517	Watts link pivot nut
8	W520214	Lateral arm-to-frame nut (2 required)
9	5A955	Height sensor
10	W506545	Lateral arm-to-frame bolt (2 required)
11	W704883	Watts link pivot stud
12	W704642	Washers (2 required)

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners must be installed with the same part number or an equivalent part if installation is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts. Orientation of the fasteners is also important on all rear suspension arms. Make sure the fasteners are installed in the same direction as they were in when removed.

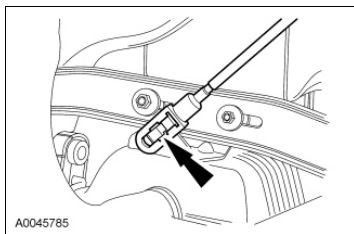
1. For reference during the installation procedure, measure the distance from the lip of the fender to the center of the wheel hub with the vehicle in a static level ground position.



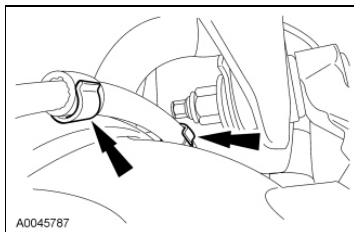
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

3. Disconnect the height sensor from the mounting bracket.



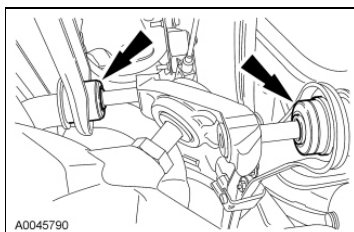
4. Remove and discard the LH lateral arm-to-frame nut and bolt.
5. Detach the parking brake cable from the retainer bracket.



6. Remove and discard the lateral arm-to-Watts link pivot nuts.
7. **NOTE:** If the Watts link pivot stud on the axle assembly loosens while removing the pivot nut, continue to loosen the pivot stud until an open-end wrench can be inserted to hold the pivot stud. While holding the pivot stud, remove the pivot nut.

Remove and discard the Watts link pivot nut.

8. Move the Watts link upwards and detach the lateral arms.
  - Remove the Watts link and LH lateral arm.



9. **NOTICE:** Do not use excessive force when removing the RH lateral arm-to-frame bolt or damage to the air spring may occur.

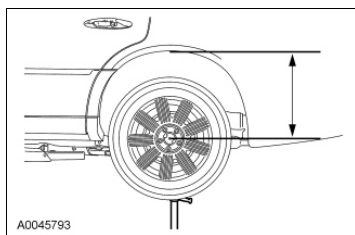
Remove the RH lateral arm-to-frame nut and bolt and remove the arm.

- Discard the nut and bolt.

10. Remove and discard the Watts link pivot stud.
11. If necessary, remove the nuts and the height sensor bracket.

### Installation

1. Position the LH lateral arm and loosely install the new LH lateral arm-to-frame nut and bolt.
2. If necessary, install the height sensor bracket.
  - Tighten the new inner nut to 11 Nm (97 lb-in).
  - Tighten the new outer nut to 12 Nm (106 lb-in).
3. Install the new Watts link pivot stud and tighten to 270 Nm (199 lb-ft).
4. Position the RH lateral arm and loosely install the new RH lateral arm-to-frame nut and bolt.
5. Position the Watts link pivot and loosely install the new lateral arm-to-Watts link pivot nuts.
6. Loosely install the new Watts link pivot nut.
7. Check and if necessary, align the front end. For additional information, refer to [Section 204-00](#).
8. Before tightening the fasteners, use a suitable jack to raise the suspension until the distance between the lip of the fender and the center of the wheel hub is equal to the measurement taken in the removal procedure.

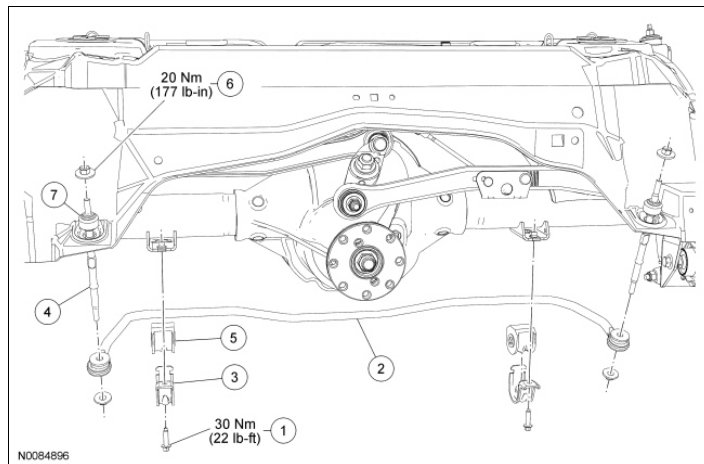


9. Tighten the Watts link pivot nut to 250 Nm (184 lb-ft).
10. Tighten the lateral arm-to-Watts link pivot nuts to 90 Nm (66 lb-ft).
11. Tighten the LH lateral arm-to-frame nut to 90 Nm (66 lb-ft).
12. Tighten the RH lateral arm-to-frame nut to 90 Nm (66 lb-ft).
13. If equipped, connect the height sensor to the mounting bracket.
14. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#). Failure to follow these instructions may result in serious personal injury.



If equipped, repower the fire suppression system.

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**Stabilizer Bar and Link**

Item	Part Number	Description
1	W500625	Stabilizer bar bracket bolt (2 required)
2	5A772	Stabilizer bar
3	4A047	Stabilizer bar bracket (2 required)
4	5664	Stabilizer bar link (2 required)
5	5494	Stabilizer bar bushing (2 required)
6	N621941	Stabilizer bar link nut (4 required)
7	5493	Stabilizer bar link bushing (8 required)


**Removal and Installation**

**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners with the same part number or an equivalent part must be installed if installation is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts. Orientation of the fasteners is also important on all rear suspension arms. Make sure the fasteners are installed in the same direction as they were in when removed.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

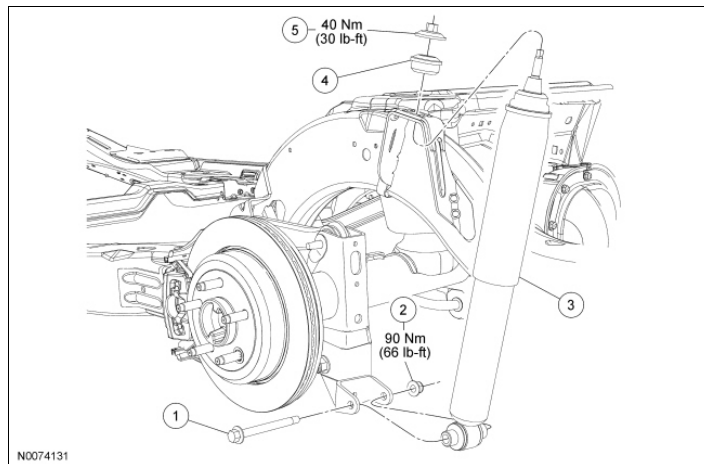
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Remove the 2 lower stabilizer bar link nuts, washers and bushings.
  - Discard the nuts.
  - To install, tighten the new nuts to 20 Nm (177 lb-in).
3. Remove the 2 upper stabilizer bar link nuts, the washers and bushings, and the stabilizer bar links.
  - Discard the nuts.
  - To install, tighten the new nuts to 20 Nm (177 lb-in).

4. Remove the 2 stabilizer bar bracket bolts, 2 brackets and the stabilizer bar.
  - Discard the 2 bracket bolts.
  - To install, tighten the new bolts to 30 Nm (22 lb-ft).
5.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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**Shock Absorber**

Item	Part Number	Description
1	W506551	Lower shock bolt
2	W520214	Lower shock nut
3	18125	Shock assembly
4	18A161	Shock washer and insulator
5	18197	Upper shock nut

**Removal and Installation**

**⚠ WARNING:** Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.


**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners with the same part number or an equivalent part must be installed if installation is necessary. Do not use a part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts.

**NOTE:** Install shock absorbers individually as required. It is not necessary to install in pairs.

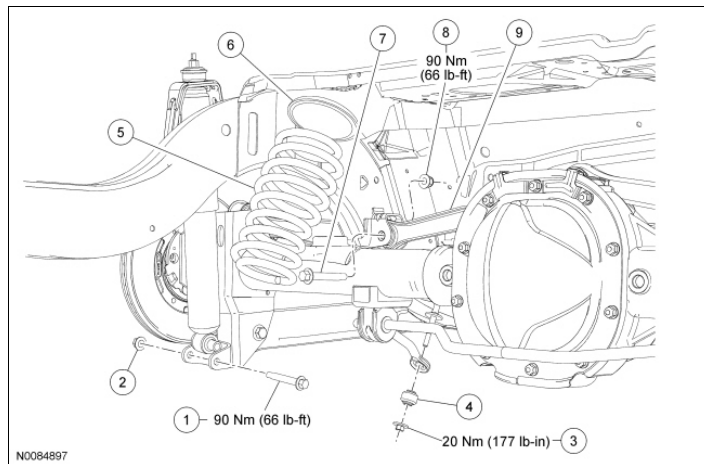
- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

- Use a suitable jack or jackstands to support the rear axle.
- Remove the upper shock nut, washer and the insulator.
  - Discard the nut, washer and insulator.

- To install, tighten the new nut to 40 Nm (30 lb-ft).
4. Remove lower shock nut, bolt and the shock absorber.
    - Discard the nut and bolt.
    - To install, tighten the new nut to 90 Nm (66 lb-ft).
  5.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure.
  6. If equipped with a fire suppression system, repower the system.
-

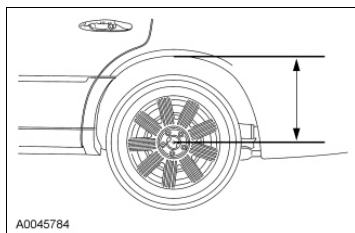
**Spring - Coil**

Item	Part Number	Description
1	W506551	Lower shock bolt
2	W520214	Lower shock nut
3	N621941	Stabilizer bar link nut
4	5493	Stabilizer bar link bushing
5	5560	Rear spring
6	5536	Rear spring insulator
7	W506545	Lateral arm bolt (2 required)
8	W520214	Lateral arm nut (2 required)
9	4264	Lateral arm (2 required)

**Removal**

**NOTICE:** Suspension fasteners are critical parts because they affect the performance of vital components and their failure may result in major service expense. Install new fasteners with the same part number or an equivalent part if installation is necessary. Do not install a part of lesser quality or substitute design. Torque values must be used as specified during reassembly to ensure correct retention of these parts.

1. For reference during the installation procedure, measure the distance from the lip of the fender to the center of the wheel hub with the vehicle in a static level ground position.



2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

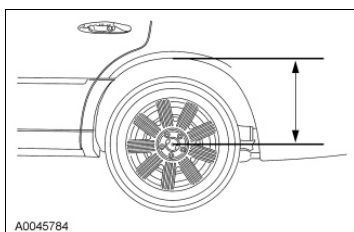
3. Disconnect the stabilizer bar from the stabilizer bar links in the following sequence.
  1. Remove the nuts and the bushings.
  2. Rotate the stabilizer bar off the links.
  3. Discard the nuts.
4. Use a suitable jack or jackstands to support the rear axle.
5. Remove the nuts and bolts and disconnect the lateral arms from the frame.
  - Discard the nuts and bolts.
6. **⚠ WARNING: Keep all body parts clear of shock absorbers or strut rods. Shock absorbers or struts can extend unassisted. Failure to follow this instruction may result in serious personal injury.**


Remove the nuts and bolts, and disconnect the shock absorbers from the axle.

  - Discard the nuts and bolts.
7. Carefully lower the jack or jackstands.
8. Remove the springs and spring insulators.

### Installation

1. Inspect the spring insulators for wear or damage.
  - Install new insulators, if necessary.
2. Install the spring insulators on the springs.
3. Install the springs and the spring insulators in the vehicle.
  - Make sure that the springs are correctly seated.
4. Raise the axle using the jack or jackstands.
5. Connect the shock absorbers to the axle and install new bolts and nuts.
  - Make sure that the bolts are installed from the inboard side.
  - Tighten the nuts to 90 Nm (66 lb-ft).
6. Connect the lateral arms to the frame and loosely install new bolts and nuts.
  - Do not tighten at this time.
7. Using the jack, raise the suspension until the distance between the lip of the fender and the center of the wheel hub is equal to the measurement taken in the removal procedure.



8. Tighten the lateral arm-to-frame bolts to 90 Nm (66 lb-ft).
9. Lower the axle and remove the suitable jack or jackstands.
10. Connect the stabilizer bar to the stabilizer bar links in the following sequence.
  1. Rotate the stabilizer bar onto the links and install the bushings.
  2. Install the new nuts and tighten to 20 Nm (177 lb-in).
11.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Material

Item	Specification	Fill Capacity
High Temperature Nickel Anti-Seize Lubricant XL-2	-	-
Motorcraft® Wheel and Tire Cleaner ZC-37-A	-	-

## General Specifications

Item	Specification
<b>Tire Inflation</b>	
Tires	See safety certification sticker located on driver door jamb.
<b>Wheel Weights</b>	
Wheel weight type	Use a wheel weight manufacturer's rim gauge to determine the correct wheel weight application

## Torque Specifications

Description	Nm	lb-in
Sensor band (worm gear)	3	27
Wheel nuts <sup>a</sup>	-	-

<sup>a</sup> Refer to the procedure in this section.



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## Wheels And Tires

**⚠ WARNING:** Vehicle may have multiple drive wheels. Do not use engine to power the driveline unless all drive wheels are elevated off the ground. Drive wheels in contact with ground could cause unexpected vehicle movement. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Always match the tire size to the wheel size during assembly. Incorrect matching can result in tire bead damage or tire separation from the wheel. Failure to follow this instruction may result in serious personal injury to technician or vehicle occupant(s).

**⚠ WARNING:** Before servicing any tire, ask the customer if anyone injected a tire sealant into the tire. Tire sealants may be flammable and can burn or explode if exposed to an ignition source. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Replacement wheels must be equivalent to the original equipment wheels in:

- load carrying capacity.
- diameter, width and offset.
- pilot hole and bolt circle.

Combined load carrying capacity of replacement wheels for a given axle, must be equal to or greater than that axle's gross axle weight rating (GAWR) identified on the vehicle's Safety Compliance Certification label. All other specifications should be evaluated by measurement of both the original wheel and the replacement wheel. If specifications are not equivalent, the safety and handling of the vehicle may be degraded, which may result in serious injury to the vehicle occupant(s).

**⚠ WARNING:** Never use wheels different than the original equipment. Additionally, never use wheel nuts different than the original equipment. Failure to follow these instructions may result in damage to the wheel or mounting system. This damage could cause the wheel to come off while the vehicle is being driven, which could result in serious personal injury or death to vehicle occupant(s).

**⚠ WARNING:** Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Keep eyes away from valve stem when deflating tires. Reduce air pressure in tire as much as possible by pushing in valve core plunger prior to removing the core. Escaping air can carry particles that can injure the eyes. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Only use replacement tires that are the same size, load index, speed rating and type (such as P-metric versus LT-metric or all-season versus all-terrain) as those originally provided by Ford. The recommended tire and wheel size may be found on either the Safety Compliance Certification Label or the Tire Label, which is located on the B-pillar or edge of the driver's door. If the information is not found on these labels, consult a Ford dealer. Use of any tire or wheel not recommended by Ford can affect the safety and performance of the vehicle, which could result in an increased risk of loss of vehicle control, vehicle rollover, personal injury and death. Additionally, the use of non-recommended tires and wheels could cause steering, suspension, axle or transfer case/power transfer unit failure.

**NOTICE:** Do not clean aluminum wheels with steel wool, abrasive-type cleaners or strong detergents or damage to the wheel finish may occur. Use Wheel and Tire Cleaner ZC-37-A or -B or equivalent.

Factory-installed tires and wheels are designed to operate satisfactorily with loads up to and including full-rated load capacity when inflated to recommended inflation pressures.

Correct tire pressure and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tire wear.

To equalize tire wear, the tires should be rotated at recommended intervals.

### **Tire Pressure Monitoring System (TPMS)**

The Tire Pressure Monitoring System (TPMS) includes:

- the Driver Door Module (DDM), TPMS functionality is integrated within the DDM .
- DDM antenna.
- four tire pressure sensors.
- four tire pressure sensor cradles.
- four tire pressure sensor straps.
- an Instrument Cluster (IC) indicator.
- a message center (if equipped).

### **Tire Pressure Monitoring System (TPMS) Module**

The DDM contains the TPMS functionality. Refer to Tire Pressure Monitoring System in Diagnosis and Testing for TPMS fault diagnosis and repair.

The DDM compares the information of each tire pressure sensor transmission against a pressure limit. If the DDM determines that the tire pressure has fallen below the low limit, the DDM communicates this to the IC on the vehicle communication bus.

### **Tire Pressure Monitoring System (TPMS) Pressure Sensor**

The DDM monitors the air pressure in the 4 road tires with tire pressure sensors. The sensors transmit radio frequency signals to the DDM approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph).

The tire pressure sensors are battery-operated and are mounted to metal brackets (called cradles) on the wheels inside the tires. The sensors are mounted 180 degrees from the valve stem.

The tire pressure sensor can be serviced separately from the cradle and the strap.

### **Tire Pressure Monitoring System (TPMS) Pressure Sensor Cradle**

The tire pressure sensor cradles are mounted to the wheels with metal straps and have an adhesive strip to aid in their retention to the wheel.

To service the sensor cradle, the strap must also be removed.

### **Tire Pressure Monitoring System (TPMS) Pressure Sensor Strap**

The sensor strap is what keeps the sensor and the cradle retained to the wheel. A factory-installed strap is joined together with a one-time use buckle and a dealer-installed strap is joined together with a worm gear (similar to a radiator hose clamp). Both straps should be discarded after removal and should not be reused.

The strap can be serviced separately from the sensor and the cradle. The sensor is available separately from the cradle and the strap. The cradle and strap are available as a strap kit. There are several different strap kits available based on wheel diameter, all strap kits share the same base part number.

### **Instrument Cluster (IC) and Message Center**



The IC illuminates the Tire Pressure Monitoring System (TPMS) indicator when it receives a message from the DDM to do so and displays the appropriate message(s) in the message center (if equipped).

The IC and message center are diagnosed and serviced in their own respective workshop manual sections.

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**Wheels And Tires****Special Tool(s)**

 <small>ST2869-A</small>	Digital Tire Gauge 204-354
 <small>ST3056-A</small>	Hunter Road Force® Wheel Balancer GSP9700 Series

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Vehicle may have multiple drive wheels. Do not use engine to power the driveline unless all drive wheels are elevated off the ground. Drive wheels in contact with ground could cause unexpected vehicle movement. Failure to follow this instruction may result in serious personal injury.

Verify the customer concern by carrying out a road test on a smooth road. If any vibrations are apparent, GO to Symptom Chart - NVH.

To maximize tire performance, inspect for signs of incorrect inflation and uneven wear, which may indicate a need for balancing, rotation or front suspension alignment.

Correct tire pressure and driving techniques have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tire wear.

Replacement tires must follow the recommended:

- tire sizes.
- speed rating.
- load range.
- tire construction type.

The use of any other tire/wheel size, load range or type can seriously affect:

- ride.
- handling.
- speedometer/odometer calibration.
- vehicle ground clearance.
- tire clearance between the body and chassis.
- wheel bearing life.
- braking performance.

New wheels need to be installed when the vehicle wheels:

- are bent.

- are cracked.
- are dented.
- are heavily corroded.
- are leaking.
- have elongated wheel hub bolt holes.
- have excessive lateral or radial runout.

It is mandatory to use only the tire sizes recommended on the tire label located on the driver door or door pillar attached to the vehicle. Larger or smaller tires can damage the vehicle, affect durability and require changing the speedometer calibration. Make sure wheel size and offsets match those recommended for the tire in use.

1. Inspect the tires for signs of uneven wear. Refer to the following descriptions to identify the type of wear and GO to Symptom Chart - Tire Wear for the appropriate repair action to be carried out.
2. Check the tires for:
  - cuts.
  - stone bruises.
  - abrasions.
  - blisters.
  - embedded objects.
3. Check the valve stems for:
  - cracks.
  - cuts.

Install a new valve stem when damage is found or any time a new tire is installed.

4. Tread wear indicators are molded into the bottom of the tread grooves. Install a new tire when the indicator bands become less than 2/32 inch.

## **Tire Wear**

Tire wear is commonly defined as a loss of tread depth. Tire tread wear occurs due to friction with the contact surface (road/pavement). The tread should wear down uniformly all the way around the circumference of the tire and all the way across the tread face. When this does not occur, the tire may have abnormal/incorrect wear.

### **Normal Tire Wear**

Normal tire wear is identified as even wear around and across the tread. Because there are many factors (driving style, road surfaces, type of vehicle, type of tire) that can affect tire wear, there is no absolute mileage expectation for a normal wear condition. A tire is considered worn-out when the tread has worn to the level of the tread-wear indicators.

### **Abnormal/Incorrect Tire Wear**

Abnormal/incorrect tire wear is identified as tire wear that is not even around or across the tread and that creates performance-related issues.

Abnormal/incorrect wear can be caused by numerous factors, some of which include driving style (aggressive, passive), climate (hot, cold), road conditions, vehicle loading and maintenance (correct tire pressure, rotation intervals and balance). It is important to determine the root cause of wear on a vehicle before carrying out repair. Tires exhibiting abnormal/incorrect tire wear may still be serviceable provided that the minimum tread

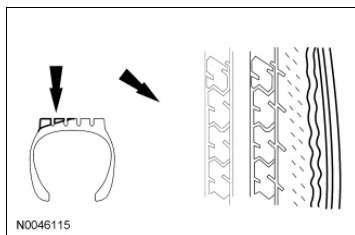
depth is greater than 2/32 inch and the tire is not causing a vehicle performance (noise/vibration) concern.

Some abnormal/incorrect wear patterns look the same all the way around the tread of the tire, other wear patterns are not consistent and can occur in various spots on the tread area. The underlying causes of the 6 wear categories are different. Refer to the following descriptions to identify the type of wear and GO to [Symptom Chart - Tire Wear](#) for the appropriate repair action to be carried out.

#### Inner Edge/Shoulder Wear

Inner edge (or shoulder) wear occurs on the inside edge of the tire and is usually caused by excessive toe out and/or excessive negative camber. If the tread depth of the outer shoulder is at least 50% greater than the tread depth of the inner shoulder, the tire is experiencing inner edge/shoulder wear. To determine whether tires have this type of wear, visually inspect the tires. In some instances, it may be necessary to measure the tread depth of each rib and compare it to that of the shoulder.

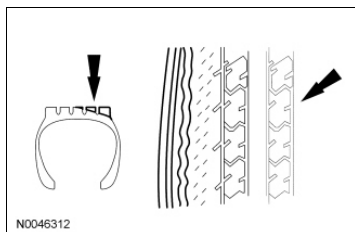
**NOTE:** RF tire shown, others similar.



#### Outer Edge/Shoulder Wear

Outer edge (or shoulder) wear occurs on the outside edge of the tire and is usually caused by excessive toe in and/or excessive positive camber. If the tread depth of the inner shoulder is at least 50% greater than the tread depth of the outer shoulder, the tire is experiencing outer edge/shoulder wear. To determine whether tires have this type of wear, visually inspect the tires. In some instances, it may be necessary to measure the tread depth of each rib and compare it to that of the shoulder.

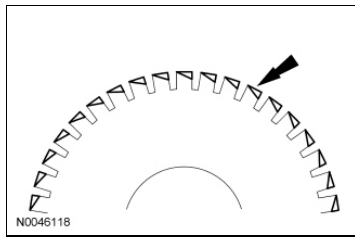
**NOTE:** RF tire shown, others similar.



#### Heel/Toe Wear

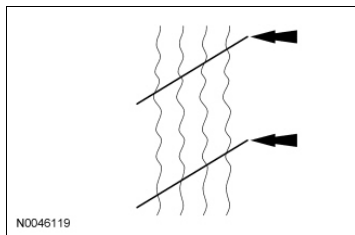
Heel/toe wear (also known as feathering) occurs along the outside or inside edge/shoulder of the tire. To determine whether tires have this type of wear, visually inspect the tires in both the inside and outside shoulder ribs. In some instances, it may be necessary to measure the difference in tread depth of leading versus trailing edge of each lug in the inside and outside shoulder rib.





### Diagonal Wear

Diagonal wear occurs diagonally across the tread area and around the circumference of the tire. To determine whether tires have this type of wear, visually inspect the tires to determine if the wear pattern runs diagonally across the tread and around the circumference of the tire. In some instances, the difference in tread depth along the diagonal wear pattern may need to be measured.



### Symptom Chart - Tire Wear

#### Symptom Chart - Tire Wear

**NOTE:** For suspension system and additional alignment diagnosis, refer to [Section 204-00](#).

#### ConditionPossible SourcesAction

- Inner edge/shoulder wear
- Excessive toe out and/or negative camber
- [GO to Pinpoint Test A](#).
- Incorrect wheel and tire assembly rotation intervals
- [GO to Pinpoint Test A](#).
- High-speed cornering
- [GO to Pinpoint Test A](#).
- Outer edge/shoulder wear
- Excessive toe in and/or positive camber
- [GO to Pinpoint Test B](#).
- Incorrect wheel and tire assembly rotation intervals
- [GO to Pinpoint Test B](#).

- High-speed cornering
- GO to Pinpoint Test B .
- Heel/toe wear
- Excessive toe in/out
- Incorrect wheel and tire assembly rotation intervals
- ROTATE the wheel and tire assemblies. CHECK the alignment, ADJUST as necessary.
- Diagonal wear
- Excessive toe in/out
- GO to Pinpoint Test C .
- Incorrect tire rotation intervals
- GO to Pinpoint Test C .
- Loose, worn or damaged suspension components
- REFER to Section 204-00 .

## Symptom Chart - NVH

### Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

### ConditionPossible SourcesAction

- Wobble or shimmy
- Bent wheel
- INSTALL a new wheel as necessary.
- Damaged tire
- INSTALL a new tire as necessary.
- Loose wheel nuts
- TIGHTEN to specification.
- High-speed shake

- Tires/wheels
- REFER to Wheel and Tire Runout Component Tests in this section.
- Vehicle vibration
- Tires/wheels
- REFER to Wheel and Tire Runout Component Tests in this section.

## Pinpoint Tests

For a description of the various tire wear patterns, refer to Inspection and Verification.

### Pinpoint Test A: Inner Edge/Shoulder Wear

**This pinpoint test is intended to diagnose the following:**

- Excessive toe out
- Incorrect wheel and tire rotation

#### PINPOINT TEST A: INNER EDGE/SHOULDER WEAR

Test Step	Result / Action to Take
<b>A1 MEASURE THE TREAD DEPTH</b>	
<ul style="list-style-type: none"> <li>• Using a tread depth gauge or similar tool, measure the inside edge/shoulder tread depth.</li> <li>• <b>Is the tread depth greater than 2/32 inch?</b></li> </ul>	<p><b>Yes</b> ROTATE the wheel and tire assemblies.</p> <p>CHECK and ADJUST the toe to nominal +0.15 degrees (toe in). CHECK and ADJUST caster and camber to nominal. REFER to <u>Section 204-00</u> .</p> <p><b>No</b> INSTALL a new tire(s). CHECK and ADJUST the toe to nominal. CHECK and ADJUST caster and camber to nominal. REFER to <u>Section 204-00</u> .</p>

### Pinpoint Test B: Outer Edge/Shoulder Wear

**This pinpoint test is intended to diagnose the following:**

- Excessive toe in
- Incorrect wheel and tire rotation

**PINPOINT TEST B: OUTER EDGE/SHOULDER WEAR**

Test Step	Result / Action to Take
<b>B1 MEASURE THE TREAD DEPTH</b>	
<ul style="list-style-type: none"> <li>Using a tread depth gauge or similar tool, measure the outside edge/shoulder tread depth.</li> <li><b>Is the tread depth greater than 2/32 inch?</b></li> </ul>	<p><b>Yes</b> ROTATE the wheel and tire assemblies.</p> <p>CHECK and ADJUST the toe to nominal -0.15 degrees (toe out). CHECK and ADJUST caster and camber to nominal. REFER to <u>Section 204-00</u> .</p> <p><b>No</b> INSTALL a new tire(s). CHECK and ADJUST the toe to nominal. CHECK and ADJUST caster and camber to nominal. REFER to <u>Section 204-00</u> .</p>

**Pinpoint Test C: Diagonal Wear**

**This pinpoint test is intended to diagnose the following:**

- Incorrect wheel and tire rotation
- Excessive toe in/out
- Incorrect tire inflation
- Loose, worn or damaged suspension components

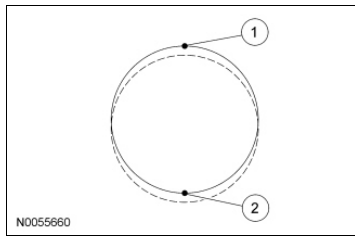
**PINPOINT TEST C: DIAGONAL WEAR**

Test Step	Result / Action to Take
<b>C1 MEASURE THE TREAD DEPTH</b>	
<ul style="list-style-type: none"> <li>Using a tread depth gauge or similar tool, measure the tread depth of the wear pattern.</li> <li><b>Is the tread depth greater than 2/32 inch?</b></li> </ul>	<p><b>Yes</b> If no performance concerns (noise/vibration) are present, the tire can remain in service. CHECK the air pressure in the tires, ADJUST as necessary. ROTATE the wheel and tire assemblies. INSPECT for loose, worn or damaged suspension components. INSTALL new components as necessary. CHECK the alignment and ADJUST as necessary. REFER to <u>Section 204-00</u> .</p> <p><b>No</b> INSTALL a new tire(s). CHECK the air pressure in the tires, ADJUST as necessary. ROTATE the wheel and tire assemblies. INSPECT for loose, worn or damaged suspension components. INSTALL new components as necessary. CHECK the alignment and ADJUST as necessary. REFER to <u>Section 204-00</u> .</p>

**Component Tests****Radial Runout**

Radial runout is the egg-shaped deviation from a perfect circle and is measured perpendicular to the circumference. On a wheel and tire assembly, this means measuring the center tire tread rib. The center rib is

indicative of the condition of the tire as a whole. Total runout is the difference between the maximum-to-minimum gauge reading. The high spot is the location of maximum runout.



Item	Description
1	High spot
2	Low spot

### Loaded Runout Measurement (Hunter Road Force® 9700 Series Wheel Balancer)

**NOTE:** Diagnosis of tire/wheel vibration should not be performed on tires with less than 320 km (200 mi). Some initial tire/wheel vibration issues (such as flat spotting) will correct themselves after the tires have been in service for 320 km (200 mi).

This procedure is intended to assist with the diagnosis of wheel and tire assembly runout and/or force variation issues.

The Hunter Road Force® 9700 Series Wheel Balancer measures the wheel and tire assembly's loaded runout and the tire's radial spring rate. The balancer then converts the runout into pounds of force (termed as Road Force®). Measuring loaded runout (Road Force®) is more effective than measuring unloaded runout using a dial indicator.

1. Using a tire crayon, record the vehicle position on the inward sidewall of all 4 tires.
2. Remove the wheel and tire assemblies. Refer to Wheel and Tire in this section.
3. **NOTE:** Use only the Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

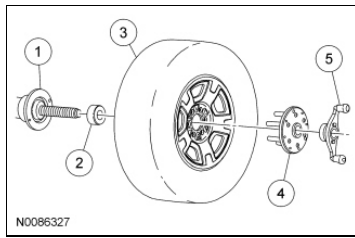
Make sure that the tire pressures are set to the correct pressure as indicated on the Vehicle Certification (VC) label.

4. **NOTICE:** Make sure that the correct wheel balancer adapters are used when mounting the assembly to the wheel balancer or damage to the wheel may occur.

**NOTE:** Make sure that the wheel and tire assembly is clean and free of foreign material prior to installation on the balancer.

**NOTE:** The wheel balancer inflation station must be turned OFF for tires with inflation pressures of 414 kPa (60 psi) or above.

Mount the wheel and tire assembly on a suitable wheel balancer using the correct wheel balancer adapters as shown. Refer to the list of recommended wheel balancer adapters on the PTS website.



Item	Description
1	Wheel balancer
2	Cone
3	Wheel and tire assembly
4	Finger plate
5	Balancer wing nut

#### 5. Measure the Road Force®.

- Temporarily mark the high spot and the Road Force® value on the sidewall of the tire. If the wheel and tire assembly Road Force® value is greater than 9 kg (20 lb), carry out the Match Mounting procedure to optimize the wheel and tire assembly.
- If the wheel and tire assembly Road Force® value is 9 kg (20 lb) or less, permanently mark the high spot and the Road Force® value on the inward sidewall of the tire for reference during future wheel and tire service. Balance the assembly and install the wheel and tire on the vehicle using the Wheel-to-Hub Optimization procedure.

### Runout Measurement (Dial Indicator)

**NOTE:** Diagnosis of tire/wheel vibration should not be performed on tires with less than 320 km (200 mi). Some initial tire/wheel vibration issues (such as flat spotting) will correct themselves after the tires have been in service for 320 km (200 mi).

**NOTE:** Loaded run-out measurements are the preferred method for verifying tire serviceability. While a dial indicator can be used to optimize the position of the tire on the wheel, the unloaded run-out measurement cannot accurately determine if the tire should be removed from service.

The following procedures should be used if normal diagnostics leads to a potential runout issue.

Some vehicles may exhibit a wheel and tire vibration caused by excessive runout. Radial runout measurements can be taken using a dial indicator and should be measured with the wheel and tire assembly mounted on a suitable wheel balancer. The dial indicator should be mounted securely to eliminate gauge movement when measuring runout.

1. **NOTE:** Use only the Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

Make sure that the tire pressures are set to the correct pressure as indicated on the VC label.

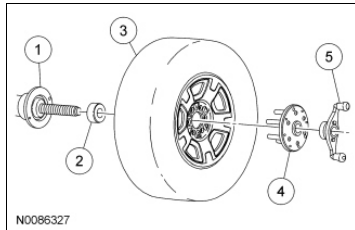
2. Using a tire crayon, record the vehicle position on the inward sidewall of all 4 tires.

3. Remove the wheel and tire assemblies. Refer to Wheel and Tire in this section.

4. **NOTICE:** Make sure that the correct wheel balancer adapters are used when mounting the assembly to the wheel balancer or damage to the wheel may occur.

**NOTE:** Make sure that the wheel and tire assembly is clean and free of foreign material prior to installation on the balancer.

Mount the wheel and tire assembly on a suitable wheel balancer using the correct wheel balancer adapters as shown. Refer to the list of recommended wheel balancer adapters on the PTS website.

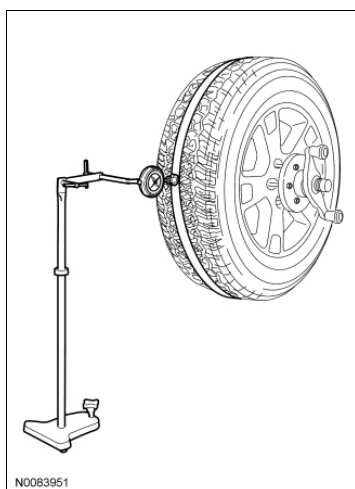


Item	Description
1	Wheel balancer
2	Cone
3	Wheel and tire assembly
4	Finger plate
5	Balancer wing nut

5. **NOTE:** Masking tape can be applied on the center tread rib to allow for a smoother measuring surface. Some fluctuation of the gauge reading is expected. Observe the overall sweep of the gauge from the highest to the lowest spot on the tire.

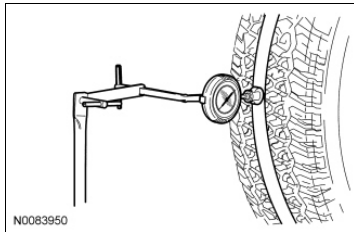
Position a suitable dial indicator and stand with the dial indicator on the center tread rib.

- Rotate the wheel and tire assembly (or wheel) to locate the low spot.
- Adjust the runout gauge to read 0.
- Rotate the wheel and tire assembly one complete revolution to make sure that the low spot has been found and that the dial indicator returns to a 0 reading.



6. While slowly and constantly rotating the wheel and tire assembly (or wheel), measure the radial runout.

- Note the variance (runout) from 0 on the dial of the gauge.
- If the runout reading of a wheel and tire assembly is greater than 1.14 mm (0.045 in), locate and temporarily mark the high spot and runout reading on the sidewall of the tire and carry out the Match Mounting procedure to optimize the wheel and tire assembly.
- If the runout reading of a wheel and tire assembly is 1.14 mm (0.045 in) or less, permanently mark the high spot and the runout reading on the inward sidewall of the tire for reference during future wheel and tire service. Balance the assembly and install the wheel and tire on the vehicle using the Wheel-to-Hub Optimization procedure.

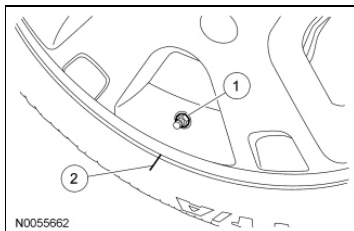


## Match Mounting

**NOTE:** Road Force® values in illustrations are shown in pounds.

Match mounting is a technique used to reduce radial runout or road force on wheel and tire assemblies. Excessive runout is a source of ride quality complaints and match mounting can be used to minimize the runout. Match mounting can be accomplished by changing the position of the tire on the wheel.

1. Position the wheel and tire assembly on a tire machine and put a reference mark on the tire sidewall at the valve stem position.



Item	Description
1	Valve stem
2	Reference mark

2. **NOTICE:** For vehicles equipped with a Tire Pressure Monitoring System (TPMS), the sensor may be damaged by incorrect tire mounting or dismounting. Dismount the tire from the wheel as instructed in the Disassembly and Assembly procedure. Failure to follow these instructions may result in TPMS component damage.

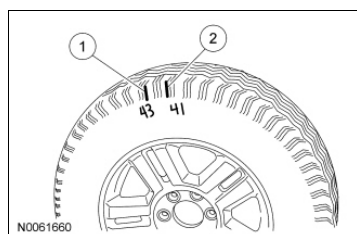
**NOTE:** Always make sure that the final high spot and measurement values are permanently marked on the inward sidewall of the tire for reference during future wheel and tire service.

Using a suitable tire machine, separate the tire beads from the wheel.

- Lubricate the tire beads using a suitable fast drying, corrosion inhibiting tire bead lubricant.

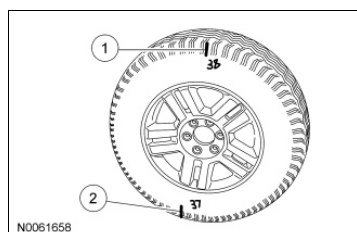


- Position the tire 180 degrees (half-way around) on the rim so the valve stem reference mark is now opposite the valve stem.
3. Re-inflate the wheel and tire assembly to the specified air pressure and measure the assembly again using a suitable dial indicator or Hunter Road Force® 9700 Series Wheel Balancer. Mark the second high spot on the tire.
    - If the runout or Road Force® is reduced to within specifications, the concern has been resolved. Balance the assembly and install on the vehicle using the Wheel-to-Hub Optimization procedure.
  4. If the second runout or Road Force® measurement is still not within specification and both high spots are close to each other (within 101.6 mm [4 in]), the root cause is probably the tire (the high spot followed the tire).
    - To be **SURE** that the tire is causing the high runout, it is necessary to have 2 runout or Road Force® measurements that are not within specification and the high spots must be in approximately the same location on the tire's sidewall. If the tire is the cause, install a new tire, balance the assembly and install on the vehicle using the Wheel-to-Hub Optimization procedure.
    - If the second high spot is not within 101.6 mm (4 in) of the first high spot, proceed to the next step.



Item	Description
1	First high spot on the tire
2	Second high spot on the tire

5. If the second high spot is still above specification and is within 101.6 mm (4 in) of being opposite the first high spot on the wheel, the root cause is probably the wheel (the high spot followed the wheel). Dismount the tire from the wheel, mount the wheel on a balancer and check the wheel runout. If the wheel runout exceeds 1.14 mm (0.045 in), install a new wheel, balance the assembly and install on the vehicle using the Wheel-to-Hub Optimization procedure.

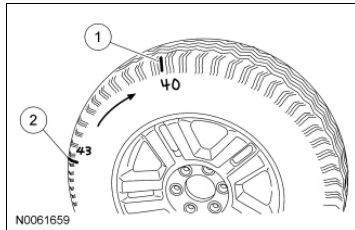


Item	Description
1	First high spot on the tire
2	Second high spot on the tire

6. **NOTE:** If the second high spot did not follow the wheel or the tire and the runout is still not within specification, improvements may be made by rotating the tire 90 degrees (one-fourth turn).

Draw an arrow on the tire sidewall from the second high spot towards the first high spot (in the shortest direction).

- Separate the tire beads from the wheel and rotate the tire 90 degrees (one-fourth turn) in the direction of the arrow.

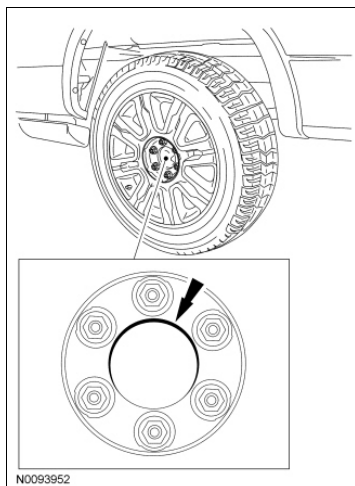


Item	Description
1	First high spot on the tire
2	Second high spot on the tire

### Wheel-to-Hub Optimization

Wheel-to-hub optimization is important. Clearance between the wheel and hub can be used to offset or neutralize the Road Force® or run-out of the wheel and tire assembly. For every 0.001 inch of wheel-to-hub clearance, the Road Force® can be affected between 1 and 3 pounds depending on the tire stiffness.

**NOTE:** The example below illustrates how the clearance between the wheel and the hub can be used to offset the high spot of radial run-out or Road Force®. Following the procedure will make sure of the best optimization.



1. Position the wheel and tire assembly on the vehicle so that the high spot location of radial run-out or Road Force® is at the 6 o'clock position and install the wheel nuts by hand until snug.
2. **NOTE:** Do not allow the full weight of the vehicle to rest on the tires while tightening the wheel nuts.




Lower the vehicle until the tires make contact with the ground, slightly loading the suspension.

Tighten the wheel nuts as described in Wheel and Tire in this section.

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**Tire Pressure Monitoring System**

## Special Tool(s)

	Activation Tool, Tire Pressure Monitor 204-363
	Digital Tire Gauge 204-354
	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation**

The Tire Pressure Monitoring System (TPMS) monitors the air pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit via radio frequency signals, to the Driver Door Module (DDM). TPMS functionality is integral to the DDM. These transmissions are sent approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The TPMS function compares each tire pressure sensor transmission against a low-pressure limit. If it has been determined that the tire pressure has fallen below this limit, the DDM communicates this on the vehicle communication bus to the Instrument Cluster (IC). The IC then illuminates the TPMS indicator and displays the appropriate message(s) in the message center (if equipped).

For vehicles with different front and rear tire pressures (such as the E-Series and certain F-Series), the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will result in a false low tire pressure event, which will cause the TPMS indicator to illuminate.

For vehicles with the same tire pressures for front and rear tires, tire rotation will not affect the system.

**Ambient Temperature Change and Tire Pressure**

**⚠ WARNING:** The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not inflate tire higher than maximum pressure stamped on tire sidewall. Premature tire wear or damage to the tire may result.

Tire pressures fluctuate with temperature changes. For this reason, tire pressure must be set to specification when tires are at outdoor ambient temperatures. If the vehicle is allowed to warm up to shop temperatures, and the outside temperature is less than shop temperature, the tire inflation pressure must be adjusted accordingly.

If the tires are inflated to specification at shop temperatures and the vehicle is moved outdoors when the outdoor ambient temperature is significantly lower, the tire pressure may drop enough to be detected by the TPMS and activate the TPMS warning lamp indicating a low tire condition.

As the ambient temperature decreases by 6°C (10°F), tire pressure decreases 7 kPa (1 psi). Adjust the tire pressure by 7 kPa (1 psi) for each 6°C (10°F) ambient temperature drop as necessary to keep the tire at the specified Vehicle Certification (VC) label pressure. Refer to the following tables to adjust the tire pressure indoors for colder outside temperatures.

Table 1. Use Table to Adjust Tire Pressure Inside Garage for Colder Outside Temperature <sup>1</sup>	
** Do Not Inflate Tire Higher than Maximum Pressure Stamped on Tire Sidewall. **	
Table is based on a Garage Temperature of 70°F. Max Pressure Adjustment is 7 psi.	
Outside Temperature (°F)	Tire Placard Pressure (PSI)
70	30 32 34 35 38 40 41 42 45 50 55 60 65 70 75 80 85 90
60	31 33 35 36 39 41 42 43 46 51 56 61 67 72 77 82 87 92
50	32 34 36 37 40 42 43 44 47 53 58 63 68 73 79 84 89 94
40	33 35 37 38 41 43 44 45 49 54 59 64 70 75 80 86 91 96
30	34 36 38 39 42 44 46 47 50 55 61 66 72 77 82 87 92 97
20	35 37 39 40 43 46 47 48 51 57 62 67 72 77 82 87 92 97
10	36 38 40 41 45 47 48 49 52 57 62 67 72 77 82 87 92 97
0	37 39 41 42 45 47 48 49 52 57 62 67 72 77 82 87 92 97
-10	37 39 41 42 45 47 48 49 52 57 62 67 72 77 82 87 92 97
-20	37 39 41 42 45 47 48 49 52 57 62 67 72 77 82 87 92 97
-30	37 39 41 42 45 47 48 49 52 57 62 67 72 77 82 87 92 97
-40	37 39 41 42 45 47 48 49 52 57 62 67 72 77 82 87 92 97

Table 2. Use Table to Adjust Tire Pressure Inside Garage for Colder Outside Temperature (Metric Units) <sup>1</sup>	
** Do Not Inflate Tire Higher than Maximum Pressure Stamped on Tire Sidewall. **	
Table is based on a Garage Temperature of 21°C. Max Pressure Adjustment is 50 kPa.	
Outside Temperature (°C)	Tire Placard Pressure (kPa)
21	205 220 235 240 260 275 285 290 310 345 380 415 450 485 515 550 585 620
16	215 230 240 250 270 285 290 295 315 350 385 420 460 495 530 565 600 635
10	220 235 250 255 275 290 295 305 325 365 400 435 470 505 545 580 615 650
4	230 240 255 260 285 295 305 310 340 370 405 440 485 515 550 595 625 660
-1	235 250 260 270 290 305 315 325 345 380 420 455 495 530 565 600 635 670
-7	240 255 270 275 295 315 325 330 350 395 425 460 495 530 565 600 635 670
-12	250 260 275 285 310 325 330 340 360 395 425 460 495 530 565 600 635 670
-18	255 270 285 290 310 325 330 340 360 395 425 460 495 530 565 600 635 670
-23	255 270 285 290 310 325 330 340 360 395 425 460 495 530 565 600 635 670
-29	255 270 285 290 310 325 330 340 360 395 425 460 495 530 565 600 635 670
-34	255 270 285 290 310 325 330 340 360 395 425 460 495 530 565 600 635 670
-40	255 270 285 290 310 325 330 340 360 395 425 460 495 530 565 600 635 670

<sup>1</sup>When Outside (Ambient) Temperature is greater than 21°C (70°F), Inflate tires to placard pressure.  
<sup>2</sup>Use the table to adjust tire pressure for P-metric and LT tires only.  
<sup>3</sup>Do NOT use table for Commercial Truck Tires (i.e. 19.5 inch tires for F450 & F550). See F-Super Duty Service Manual for tire inflation procedure.

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## Tire Pressure Monitoring System (TPMS) Indicator and Message Center Messages

The TPMS indicator and vehicle message center (if equipped) sometimes displays faults that cannot be resolved by the customer. Treat these messages as TPMS faults that must be serviced.

## Tire Pressure Monitoring System (TPMS) Indicator Illuminates Continuously

**NOTE:** A full-sized, matching spare wheel and tire, that is identical to the road wheel and tire, is available as an optional accessory. This spare wheel and tire is equipped with a tire pressure sensor but the sensor is not initially programmed to the Driver Door Module (DDM).

If this spare wheel and tire is in use on the vehicle, the sensor must be trained to the DDM and the remaining 3 sensors must be retrained to the DDM as well. If all 4 sensors are not trained to the DDM, the TPMS warning indicator will illuminate.

Make sure that all the wheels and tires installed on the vehicle are inflated to the correct pressure and trained to the DDM before attempting to diagnose a TPMS concern. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

**NOTE:** If the spare tire is in use (including the optional full-sized, matching spare wheel and tire), the damaged road tire must be repaired and installed on the vehicle to restore complete TPMS functionality before carrying out any diagnosis.

**NOTE:** For vehicles with different front and rear tire pressures (such as F-Series and E-Series), the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will result in a false low tire pressure event, which will cause the TPMS indicator to illuminate.

For vehicles with the same tire pressures for front and rear tires, tire rotation will not affect the system.

1. The TPMS indicator remains on continuously for the following condition:
  - **Low Tire Pressure** - The TPMS indicator is illuminated solid and the message center displays **LOW TIRE PRESSURE** (if equipped). This is displayed when any of the tire pressures are low. When this condition exists, the tire pressure must be adjusted to the recommended cold pressure as indicated on the VC label.
2. **NOTE:** The TPMS sensors do not transmit when the vehicle is stationary. If the vehicle has been stationary for more than 30 minutes, it will be necessary to wake up the sensors so they will transmit the latest tire pressure information to the DDM .


If the vehicle has been stationary for more than 30 minutes, activate the TPMS sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

### **Tire Pressure Monitoring System (TPMS) Indicator Flashes**

The TPMS indicator flashes for 70 seconds and then remains ON solid when the ignition key is turned to the ON position for the following conditions:

1. **Tire Pressure Sensor Fault** - If equipped, the message center will display **TIRE SENSOR FAULT** when a tire pressure sensor is malfunctioning. GO to Symptom Chart .
2. **No Communication With the DDM ( TPMS is integral to the DDM )** - The TPMS indicator is illuminated when the Instrument Cluster (IC) has received no signals from the DDM for more than 5 seconds. If equipped, the message center displays **TIRE MONITOR FAULT**. GO to Symptom Chart .
3. **Tire Pressure Monitor Fault** - If equipped, the message center will display **TIRE MONITOR FAULT** when the tire pressure monitoring system is malfunctioning or communication with the IC has been lost. GO to Symptom Chart .

### **Inspection and Verification**

 **WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. **NOTE:** The tire pressure sensors are not designed to be used with aftermarket wheels.

**NOTE:** The use of run-flat tires (tires with steel body cord plies in the tire sidewall) where not originally equipped, may cause the TPMS system to malfunction and is therefore not recommended.

Verify the customer concern by inspecting the vehicle and observing the message center (if equipped) and the TPMS indicator.

2. **NOTE:** The valve-mounted TPMS sensors and the strap-mounted TPMS sensors are not compatible. Swapping wheels from one vehicle to another with the different systems will cause the system to set a fault.

**NOTE:** Non-OEM modifications made to the vehicle may result in false TPMS warnings.

**NOTE:** Swapping wheels on vehicles with the same TPMS sensors will set a fault if the sensors are not trained. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

Inspect to determine if one of the following mechanical or electrical concerns apply:

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Low tire pressure</li> <li>• Tire Pressure Monitoring System (TPMS) sensor damaged or missing</li> <li>• Full-sized, matching spare tire installed on the vehicle</li> <li>• Spare tire installed as a road wheel</li> <li>• Incorrect TPMS sensor installed</li> <li>• TPMS sensor installed incorrectly</li> <li>• Non-OEM wheels installed (aftermarket rims)</li> <li>• Non-OEM equipped run-flat tires installed</li> <li>• Other non-OEM modifications (roll cages, service barriers, part racks, ladder racks)</li> </ul>	<ul style="list-style-type: none"> <li>• Wire, terminals or connectors</li> <li>• Driver Door Module (DDM) missing or damaged</li> <li>• Aftermarket electronic accessories</li> <li>• Battery Junction Box (BJB) fuse(s):                         <ul style="list-style-type: none"> <li>◆ 2 (7.5A)</li> <li>◆ 8 (20A)</li> <li>◆ 114 (20A)</li> </ul> </li> <li>• Central Junction Box (CJB) fuse(s):                         <ul style="list-style-type: none"> <li>◆ 5 (7.5A)</li> <li>◆ 8 (20A)</li> <li>◆ 9 (7.5A)</li> <li>◆ 19 (7.5A)</li> <li>◆ 26 (10A)</li> <li>◆ 28 (7.5A)</li> </ul> </li> <li>• DDM antenna disconnected</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:
  - verify the ignition key is in the ON position.
  - verify the scan tool operation with a known good vehicle.
  - refer to [Section 418-00](#) to diagnose no response from the PCM.
7. Carry out the network test.
  - If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#).
  - If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).
8. Clear the continuous DTCs and carry out the self-test diagnostics for the DDM.
9. If the DTCs retrieved are related to the concern, go to the Tire Pressure Monitoring System (TPMS) Driver Door Module (DDM) DTC Chart. For all other DTCs, refer to [Section 419-10](#).
10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#).

## DTC Charts

### Tire Pressure Monitoring System (TPMS) Driver Door Module (DDM) DTC Chart

DTC	Description	Action
B106A	Pressure Sensor Range Bit Incorrect State	<a href="#">GO to Pinpoint Test G</a> .
B106B	Tire Pressure Sensor Low Battery (Could be set configuring new DDM)	<a href="#">GO to Pinpoint Test H</a> .
B106D	Tire Pressure Monitoring System (TPMS) Initiators Not Configured	DTC B106D is only present when a new DDM is installed, the DDM is incorrectly flashed or the DDM is incorrectly configured. Successfully configuring the DDM is the only way to clear this DTC. VERIFY the DDM is correctly configured. If DTC B106D is still present, REFER to <a href="#">Section 418-01</a> .
B2477	Module Configuration Failure/Mismatch	DTC B2477 is only present when a new DDM is installed, the DDM is incorrectly flashed or the DDM is incorrectly configured. Successfully configuring the DDM is the only way to clear this DTC. Make sure the DDM is configured correctly. If DTC B2477 is still present, REFER to <a href="#">Section 418-01</a> .
B2868	LF Tire Pressure Sensor Fault	DTC B2868 is only present when a new DDM is installed, the DDM is flashed or the DDM is reconfigured. TRAIN the tire pressure sensors. REFER to <a href="#">Tire Pressure Monitoring System (TPMS) Sensor Training</a> in this section.
B2869	RF Tire Pressure Sensor Fault	DTC B2869 is only present when a new DDM is installed, the DDM is flashed or the DDM is reconfigured. TRAIN the tire pressure sensors. REFER to <a href="#">Tire Pressure Monitoring System (TPMS) Sensor Training</a> in this section.
B287A	Tire Pressure System Fault	<a href="#">GO to Pinpoint Test E</a> .
B2870	RR Tire Pressure Sensor Fault	DTC B2870 is only present when a new DDM is installed, the DDM is flashed or the DDM is reconfigured. TRAIN the tire pressure sensors. REFER to <a href="#">Tire Pressure Monitoring System (TPMS) Sensor Training</a> in this section.



B2871	LR Tire Pressure Sensor Fault	DTC B2871 is only present when a new DDM is installed, the DDM is flashed or the DDM is reconfigured. TRAIN the tire pressure sensors. REFER to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.
B2872	Tire Pressure Sensor Fault	<p><b>NOTE:</b> If the vehicle has been stationary for more than 30 minutes, the sensors will go into a "sleep mode" to conserve battery power. It will be necessary to wake them up so they will transmit the latest tire pressure information to the DDM .</p> <p>ACTIVATE the TPMS sensors. REFER to <u>Tire Pressure Monitoring System (TPMS) Sensor Activation</u> in this section. <u>GO to Pinpoint Test F</u> .</p>
C2780	Electronic Control Unit (ECU) in Manufacturing Mode	DTC C2780 is only present when a new DDM is installed, the DDM is flashed or the DDM is reconfigured. TRAIN the tire pressure sensors. REFER to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.

## Symptom Chart

**NOTE:** For vehicles with different front and rear tire pressures (such as the E-Series and certain F-Series), the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will result in a false low tire pressure event, which will cause the Tire Pressure Monitoring System (TPMS) indicator to illuminate.

For vehicles with the same tire pressures for front and rear tires, tire rotation will not affect the system.

Failure of a TPMS component may not cause the message center to display a fault message or a DTC to be stored. The Symptom Chart is a starting point to begin diagnosis of these concerns.

## Symptom Chart

## Pinpoint Tests

### Pinpoint Test D: Tire Pressure Monitoring System (TPMS) Indicator ON Solid When the Ignition Key is Turned to the ON Position and Message Center (if equipped) Displays LOW TIRE PRESSURE

#### Normal Operation

The Tire Pressure Monitoring System (TPMS) monitors the air pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit via radio frequency signals, to the Driver Door Module (DDM). TPMS functionality is integral to the DDM . These transmissions are sent approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The TPMS function (integral to the DDM ) compares each tire pressure sensor transmission against a low-pressure limit. If it has been determined that the tire pressure has fallen below this limit, the DDM communicates this on the vehicle communication bus to the Instrument Cluster (IC). The IC then illuminates the TPMS indicator and displays the appropriate message(s) in the message center (if equipped).

#### This pinpoint test is intended to diagnose the following:

- Low air pressure in tire(s)
- Tire pressure sensor(s)

**PINPOINT TEST D: TPMS INDICATOR ON SOLID WHEN THE IGNITION KEY IS TURNED TO THE ON POSITION AND MESSAGE CENTER (IF EQUIPPED) DISPLAYS LOW TIRE PRESSURE**

**NOTE:** Use only a Digital Tire Gauge any time tire pressures are measured to be sure that accurate values are obtained.

**NOTE:** If a warranty case is opened for an actual TPMS fault, document and include the actual tire pressure data in all warranty communications.

**NOTE:** A full-sized, matching spare wheel and tire, that is identical to the road wheel and tire, is available as an optional accessory. This spare wheel and tire is equipped with a tire pressure sensor, but the sensor is not initially programmed to the DDM . If this spare wheel and tire is in use on the vehicle, the sensor must be trained to the DDM and the remaining 3 sensors must be retrained to the DDM as well. If all 4 sensors are not trained to the DDM , the TPMS warning indicator will illuminate. Make sure that all the wheels and tires installed on the vehicle are inflated to the correct pressure and trained to the DDM before attempting to diagnose a TPMS concern. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

Test Step	Result / Action to Take
<b>D1 CHECK THE TIRE PRESSURE</b>	
<ul style="list-style-type: none"> <li>• Measure and record the air pressure in all 4 road tires.</li> <li>• Adjust the air pressure for those found to be below the specification listed on the Vehicle Certification (VC) label.</li> <li>• <b>NOTE:</b> If the vehicle has been stationary for more than 30 minutes, activate the TPMS sensors. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Activation</u> in this section. TPMS sensors do not transmit when the vehicle is stationary.</li> <li>• Verify system operation.</li> <li>• <b>Have the TPMS indicator and the message center (if equipped) warnings gone out?</b></li> </ul>	<p><b>Yes</b> The system is functioning normally, diagnosis is complete. INFORM the customer of correct tire pressure maintenance as instructed in the scheduled maintenance guide and the Owner's Literature.</p> <p><b>No</b> GO to <u>D2</u> .</p>
<b>D2 CHECK THE SYSTEM COMPONENTS</b>	
<ul style="list-style-type: none"> <li>• Train all 4 tire pressure sensors. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger DDM .</li> <li>• Read and record the following PIDs:</li> </ul>	<p><b>Yes</b> The system is functioning normally, diagnosis complete.</p> <p><b>No</b> <b>Before installing a new sensor(s):</b> If a sensor(s) does not respond to the special tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth turn and ATTEMPT to activate the same sensor(s) again. INSTALL new tire pressure sensors for those with discrepancies or those that fail to activate. REFER to <u>Tire Pressure Monitoring System (TPMS)</u></p>

<ul style="list-style-type: none"> <li>◆ Left front tire pressure (LF_PSI)</li> <li>◆ Right front tire pressure (RF_PSI)</li> <li>◆ Left rear tire pressure (LR_PSI)</li> <li>◆ Right rear tire pressure (RR_PSI)</li> <li>• Compare the air pressure readings recorded from the function test to those recorded in E1.</li> <li>• <b>Do the compared tire pressure values match within <math>\pm 34.47</math> kPa (<math>\pm 5</math> psi), and have the TPMS indicator and the message center (if equipped) warnings gone out?</b></li> </ul>	<u>Sensor</u> in this section.
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### Pinpoint Test E: The Driver Door Module (DDM) Will Not Enter Sensor Training Mode

#### Normal Operation

For the Driver Door Module (DDM) to enter Tire Pressure Monitoring System (TPMS) sensor training mode, it must receive valid inputs from the following:

- Brake Pedal Position (BPP) switch - OFF-ON-OFF
- Ignition switch - both OFF and RUN
- Vehicle speed sensor - 0 km/h (0 mph)

Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section for the complete sensor training procedure.

The Brake Pedal Position (BPP) switch input is supplied to Central Junction Box (CJB) fuse 28 (7.5A) along circuit 511 (LG) and then to the Lighting Control Module (LCM) along circuit 1651 (WH/RD). The LCM then provides the BPP information to the DDM along the Standard Corporate Protocol (SCP) communication bus.

The ignition switch input is supplied to the LCM from CJB fuse 8 (10A) along circuit 640 (RD/YE) and DDM fuse 5 (7.5A) along circuit 297 (BK/LG). The LCM then provides the ignition switch information to the DDM along the SCP communication bus. The vehicle speed input is supplied by the PCM to the IC along the High Speed Controller Area Network (HS-CAN) bus, then from the Instrument Cluster (IC) to the DDM along the SCP communication bus.

#### **This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Ignition switch
- Vehicle Speed Sensor (VSS)
- BPP switch
- PCM
- DDM

**PINPOINT TEST E: THE DRIVER DOOR MODULE (DDM) WILL NOT ENTER SENSOR TRAINING MODE**

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>E1 CHECK FOR MODULE DTCs</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Connect the scan tool.</li> <li>Ignition ON.</li> <li>Retrieve and record any LCM , PCM, DDM , HS-CAN bus or SCP bus DTCs.</li> <li><b>Are there any DTCs present?</b></li> </ul>	<p><b>Yes</b> For LCM DTCs, REFER to <a href="#">Section 419-10</a> .</p> <p>For PCM DTCs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>For DDM DTCs, REFER to <a href="#">Section 419-10</a> .</p> <p>For HS-CAN bus and SCP bus DTCs, REFER to <a href="#">Section 418-00</a> .</p> <p><b>No</b> GO to <a href="#">E2</a> .</p>
<b>E2 CHECK THE VSS</b>	
<ul style="list-style-type: none"> <li>Drive the vehicle and observe the speedometer.</li> <li><b>Is the speedometer working and displaying the correct speed?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">E3</a> .</p> <p><b>No</b> REFER to <a href="#">Section 413-01</a> to diagnose the IC .</p>
<b>E3 CHECK THE LCM BRAKE PEDAL SWITCH (LCM_BOO) PID</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: DataLogger LCM .</li> <li>Observe the LCM_BOO PID while pressing and releasing the brake pedal.</li> <li><b>Does the PID match the BPP ?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">E4</a> .</p> <p><b>No</b> REFER to <a href="#">Section 417-01</a> to diagnose the BPP switch.</p>
<b>E4 CHECK THE LCM IGNITION SWITCH (IGN_SW) PID</b>	
<ul style="list-style-type: none"> <li>Observe the IGN_SW PID while turning the ignition switch from RUN to OFF and back to RUN again.</li> <li><b>Does the PID match the ignition switch position?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">E5</a> .</p> <p><b>No</b> REFER to <a href="#">Section 419-10</a> to diagnose the LCM .</p>
<b>E5 CHECK THE DDM CONNECTORS</b>	
<ul style="list-style-type: none"> <li>Disconnect all the DDM connectors.</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p>

<ul style="list-style-type: none"> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> <li>◆ spread terminals.</li> </ul> </li> <li>• Connect all the DDM connectors and make sure that they are seated correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>No</b></p> <p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>
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**Pinpoint Test F: TPMS Indicator FLASHES For 70 Seconds and Then Remains ON Continuously When the Ignition Key is Turned to the ON Position, the Message Center (if equipped) Displays TIRE PRESSURE SENSOR FAULT or TIRE PRESSURE MONITOR FAULT and DTC B2872 or B287A is Present**

**Normal Operation**

A full-sized, matching spare wheel and tire, that is identical to the road wheel and tire, is available as an optional accessory. This spare wheel and tire is equipped with a tire pressure sensor but the sensor is not initially programmed to the Driver Door Module (DDM). If this spare wheel and tire is in use on the vehicle, the sensor must be trained to the DDM and the remaining 3 sensors must be retrained to the DDM as well. If all 4 sensors are not trained to the DDM, the Tire Pressure Monitoring System (TPMS) warning indicator will illuminate.

Make sure that all the wheels and tires installed on the vehicle are inflated to the correct pressure and trained to the DDM before attempting to diagnose a TPMS concern. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

If there is a fault with 1, 2 or 3 of the Tire Pressure Monitoring System (TPMS) sensors, DTC B2872 sets. The TPMS warning indicator flashes for 70 seconds and then remains ON continuously when the ignition switch is turned to the ON position and the message center (if equipped) displays TIRE PRESSURE SENSOR FAULT.

If the DDM does not get a response from **all** 4 of the TPMS sensors, DTC B287A sets and the message center (if equipped) displays TIRE PRESSURE MONITOR FAULT.

It should be noted that TPMS communication can be interrupted by Radio Frequency Interference (RFI), which can cause intermittent issues. RFI is generated by electrical motors and appliance operation, cellular telephones, remote transmitters, power inverters and portable entertainment equipment. Anytime the TPMS sensor training procedure is performed successfully, the warning indicator is extinguished and the vehicle must be driven for 18-20 minutes before the SJB initiates a self test to verify system operation.

- DTC B2872 (Tire Pressure Sensor Fault) - set by the DDM when 1, 2 or 3 of the tire pressure sensors are faulted or not responding or when data is not received by the DDM.
- DTC B287A (Tire Pressure Monitor Fault) - set by the DDM when **all** 4 of the tire pressure sensors are faulted, not responding or when data is not received by the DDM.

**This pinpoint test is intended to diagnose the following:**

- Intermittent TPMS operation due to RFI
- TPMS sensor(s) not trained
- Not all TPMS sensors are installed
- TPMS sensor(s)

- DDM antenna
- DDM

**PINPOINT TEST F: TPMS INDICATOR FLASHES FOR 70 SECONDS AND THEN REMAINS ON CONTINUOUSLY WHEN THE IGNITION KEY IS TURNED TO THE ON POSITION, THE MESSAGE CENTER (IF EQUIPPED) DISPLAYS TIRE PRESSURE SENSOR FAULT OR TIRE PRESSURE MONITOR FAULT AND DTC B2872 OR B287A IS PRESENT**

Test Step	Result / Action to Take
<b>F1 CHECK THE HORN OPERATION</b>	
<ul style="list-style-type: none"> <li>• Depress the steering wheel horn pad for 2 seconds.</li> <li>• <b>Does the horn sound?</b></li> </ul>	<p><b>Yes</b> GO to <b>F2</b> .</p> <p><b>No</b> For horn diagnosis, REFER to <u>Section 413-06</u> .</p>
<b>F2 CARRY OUT THE SENSOR TRAINING PROCEDURE</b>	
<p><b>NOTE:</b> Make sure that all aftermarket electronic equipment has been disconnected (if possible) and that the customer has been questioned about the kinds of electronic equipment they may have been using in the vehicle when this issue was identified.</p> <ul style="list-style-type: none"> <li>• Train all 4 tire pressure sensors. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.</li> <li>• <b>Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the DDM ?</b></li> </ul>	<p><b>Yes</b> The system is operating correctly at this time. The concern may have been caused by RFI .</p> <p>CLEAR the DTCs. REPEAT the self-test. TEST for normal operation.</p> <p>REFER to PID Definitions and Intermittent Troubleshooting in this section for information on locating sources of RFI .</p> <p><b>No</b> GO to <b>F3</b> .</p>
<b>F3 CHECK FOR CORRECT TPMS OPERATION</b>	
<ul style="list-style-type: none"> <li>• Move the vehicle to rotate the wheels at least one-fourth of a turn. Leave the vehicle doors open.</li> <li>• Train all 4 tire pressure sensors. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.</li> <li>• <b>Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the DDM ?</b></li> </ul>	<p><b>Yes</b> The system is operating correctly at this time. The concern may have been caused by RFI . CLEAR the DTCs. REPEAT the self-test. TEST for normal operation. REFER to PID Definitions and Intermittent Troubleshooting in this section for information on locating sources of RFI .</p> <p><b>No</b> GO to <b>F4</b> .</p>
<b>F4 CHECK FOR CORRECT DDM AND DDM ANTENNA OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM electrical connectors.</li> <li>• Check the connectors for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ pushed-out pins</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <b>F5</b> .</p> <p><b>No</b> The system is operating correctly at this time.</p>

<ul style="list-style-type: none"> <li>◆ bent pins</li> <li>◆ spread terminals</li> <li>• Connect all the DDM connectors and make sure that they are seated correctly.</li> <li>• Attempt to train the system and verify the concern is still present. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p>The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>
<p><b>F5 CHECK FOR CORRECT DDM ANTENNA OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - DDM .</li> <li>• Read and record the following PIDs: <ul style="list-style-type: none"> <li>◆ Left Front Pressure Sensor Identifier (LF_ID)</li> <li>◆ Right Front Pressure Sensor Identifier (RF_ID)</li> <li>◆ Left Rear Pressure Sensor Identifier (LR_ID)</li> <li>◆ Right Rear Pressure Sensor Identifier (RR_ID)</li> </ul> </li> <li>• Retrieve and record the last received tire transmitter ID code value (LAST_ID) PID.</li> <li>• <b>NOTE:</b> The sensor identifiers can be in any order, as the wheels may have been rotated. Make sure that the module can hear each of the recorded sensor identifiers.</li> <li>• Monitor the LAST_ID PID while using the Tire Pressure Monitor Activation Tool to activate each sensor. As each sensor is activated with the tool, compare the value of the LAST_ID PID to the list of sensor identifiers recorded previously. As each sensor is activated with the tool, the LAST_ID PID should match the previously recorded ID of that sensor.</li> <li>• <b>Did the PID transition between each recorded sensor identifiers as each sensor was activated with the tool?</b></li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> INSTALL a new DDM antenna. REFER to <u>Section 501-14</u> . CLEAR the DTCs. REPEAT the self-test. REFER to Wiring Diagrams Cell 151, Component Location Views for antenna connector location information.</p>

### Pinpoint Test G: DTC B106A

#### Normal Operation

If there is a fault in the Tire Pressure Monitoring System (TPMS), such as a damaged or missing sensor(s), damaged module or a communication issue within the vehicle, DTCs are set in the Driver Door Module (DDM). The TPMS warning indicator will flash for 70 seconds and then remain ON solid when the ignition switch is turned to the ON position and the message center (if equipped) will display TIRE PRESSURE SENSOR FAULT.

This DTC may be encountered if a high-pressure sensor (designed for trucks with much higher tire pressures and molded in green plastic) was installed. The DDM will only allow a low-pressure sensor to be trained using the TPMS sensor training procedure. Make sure the correct sensors are used to avoid compatibility issues.

- DTC B106A (Pressure Sensor Range Bit Incorrect State) - When an attempt has been made to train a non-compatible sensor, the DDM will set DTC B106A.

**This pinpoint test is intended to diagnose the following:**

- Tire pressure sensor(s)
- Incorrect tire pressure sensor(s) installed
- DDM

#### PINPOINT TEST G: DTC B106A

Test Step	Result / Action to Take
<b>G1 DETERMINE IF THE VEHICLE IS EQUIPPED WITH AN INCORRECT SENSOR</b>	
<ul style="list-style-type: none"> <li>• Train all 4 tire pressure sensors. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.</li> <li>• <b>Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the DDM ?</b></li> </ul>	<p><b>Yes</b> CLEAR the DTCs. REPEAT the self-test. VERIFY system operation.</p> <p><b>No</b> <b>Before installing a new sensor(s) :</b> If a sensor(s) does not respond to the Tire Pressure Monitor Activation Tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth turn and ATTEMPT to activate the same sensor(s) again.</p> <p>If the sensor(s) fails to train a second time, INSTALL a new tire pressure sensor(s). REFER to <u>Tire Pressure Monitoring System (TPMS) Sensor</u> in this section.</p>

#### Pinpoint Test H: DTC B106B

##### Normal Operation

If there is a fault in the Tire Pressure Monitoring System (TPMS), such as a damaged or missing sensor(s), damaged module or a communication issue within the vehicle, DTCs are set in the Driver Door Module (DDM). The TPMS warning indicator will flash for 70 seconds and then remain ON solid when the ignition switch is turned to the ON position and the message center (if equipped) will display TIRE PRESSURE SENSOR FAULT.

The tire pressure sensor is battery powered.

This DTC may be set when attempting to train a tire pressure sensor(s) with a low battery.

- DTC B106B (Tire Pressure Sensor Low Battery) - The pressure sensors are battery powered. If the battery is low and the sensors are trained, DTC B106B may be set. Also, if a new DDM is installed



and one or more sensors have low batteries, DTC B106B may be set.

**This pinpoint test is intended to diagnose the following:**



- Tire pressure sensor battery (part of the sensor)
- Tire pressure sensor(s)
- DDM

**PINPOINT TEST H: DTC B106B**

Test Step	Result / Action to Take
<b>H1 DETERMINE WHICH SENSOR HAS A LOW BATTERY</b>	
<ul style="list-style-type: none"> <li>• Train all 4 tire pressure sensors. Refer to <u>Tire Pressure Monitoring System (TPMS) Sensor Training</u> in this section.</li> <li>• <b>Did all of the tire pressure sensors transmit correctly and did the horn sound when each tire pressure sensor transmitted to the DDM ?</b></li> </ul>	<p><b>Yes</b> CLEAR the DTCs. REPEAT the self-test. VERIFY system operation.</p> <p><b>No</b> <b>Before installing a new sensor(s) :</b> If a sensor(s) does not respond to the special tool, ATTEMPT to activate the same sensor(s) with the Tire Pressure Monitor Activation Tool. If the sensor(s) still does not respond, MOVE the vehicle to rotate the wheels at least one-fourth turn and ATTEMPT to activate the same sensor(s) again.</p> <p>If the sensor(s) fail to train a second time, INSTALL a new tire pressure sensor(s). REFER to <u>Tire Pressure Monitoring System (TPMS) Sensor</u> in this section.</p>

**Tire Pressure Monitoring System (TPMS) Sensor Training**

## Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**NOTE:** If the vehicle has been stationary for more than 30 minutes, the sensors will go into a "sleep mode" to conserve battery power. It will be necessary to wake them up so they will transmit the latest tire pressure information to the Driver Door Module (DDM). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

**NOTE:** The tire pressure sensor training procedure must be done on a single vehicle, in an area without Radio Frequency Interference (RFI) and at least 1 m (3 ft) away from other vehicles equipped with a Tire Pressure Monitoring System (TPMS).


RFI noise is generated by electrical motors and appliance operation, cellular telephones, remote transmitters, power inverters and portable entertainment equipment.

**NOTE:** If a sensor does not respond to the Tire Pressure Monitor Activation Tool, attempt to activate the same sensor with the Tire Pressure Monitor Activation Tool. If the sensor still does not respond, move the vehicle to rotate the wheels at least one-fourth turn and attempt to activate the same sensor again.

**NOTE:** The DDM has a 2-minute time limit between sensor responses. If the DDM does not recognize any 1 of the 4 tire pressure sensors during this time limit, the horn will sound twice and the message center (if equipped) will display TIRE NOT TRAINED REPEAT and the entire procedure must be repeated.

**NOTE:** For vehicles with different front and rear tire pressures (such as the E-Series and certain F-Series), the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors will result in a false low tire pressure event, which will cause the TPMS indicator to illuminate.


For vehicles with the same tire pressures for front and rear tires, tire rotation will not affect the system.

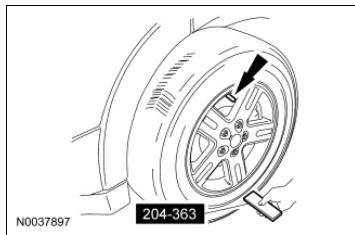
1. **NOTE:**  An animated version of this procedure is available on-line.

Turn the ignition switch to the OFF position, then press and release the brake pedal.

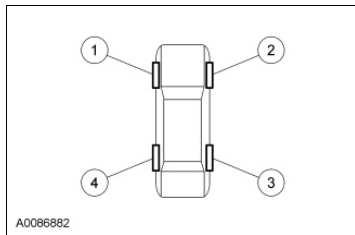
2. Cycle the ignition switch from the OFF position to the RUN position 3 times, ending in the RUN position.
3. Press and release the brake pedal.
4. Turn the ignition switch to the OFF position.

5. Turn the ignition switch from the OFF position to the RUN position 3 times, ending in the RUN position.
  - The horn will sound once and the TPMS indicator will flash if the training mode has been entered successfully. If equipped, the message center will display TRAIN LF TIRE.
6. **NOTE:** It may take up to 6 seconds to activate a tire pressure sensor. During this time, the activation tool must remain in place 180 degrees from the valve stem.

Place the Tire Pressure Monitor Activation Tool on the LF tire sidewall opposite (180 degrees) from the valve stem. Press and release the test button on the special tool. The horn will sound briefly to indicate that the tire pressure sensor has been recognized by the DDM .  An animated version of this procedure is available on-line.



7. Within 2 minutes of the horn sounding, place the activation tool on the RF tire sidewall opposite (180 degrees) from the valve stem and press and release the test button to train the RF tire pressure sensor.



8. **NOTE:** Do not wait more than 2 minutes between training each sensor or the DDM will time out and the entire procedure must be repeated.

Repeat Step 7 for the RR and LR tires.

The procedure is completed after the last tire has been trained. When the training procedure is complete, the message center (if equipped) will display TIRE TRAINING COMPLETE.

For vehicles not equipped with a message center, successful completion of the training procedure will be verified by turning the ignition switch to the OFF position without the horn sounding. If the horn sounds twice when the switch is turned to the OFF position, the training procedure was not successful.

9. Using the scan tool, locate the updated TPMS sensor identifiers trained to the DDM and document them on the applicable warranty claim.
10. **NOTE:** This step is required to clear DTC C2780, cause the DDM to exit the manufacturing mode and to make sure there are no other concerns with a newly programmed DDM .

If the sensors are being trained due to the installation of a new DDM , clear any DTCs and perform the DDM on-demand self-test.



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**Tire Pressure Monitoring System (TPMS) Sensor Activation**

## Special Tool(s)

	Activation Tool, Tire Pressure Monitor 204-363
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**NOTE:** The tire pressure sensors will go into a "sleep mode" after 30 minutes of inactivity to conserve battery power. The sensors do not transmit information while in sleep mode. It will be necessary to wake them up so they will transmit the latest tire pressure information.

1. Turn the ignition switch to the ON position.
2. Position the Tire Pressure Monitor Activation Tool against the LF tire sidewall, 180 degrees from the tire valve stem.
3. **NOTE:** The Tire Pressure Monitor Activation Tool will provide feedback in the form of a flashing green light and a beep sound for each successful response from a tire pressure sensor.

Press the test button on the Tire Pressure Monitor Activation Tool to activate the sensor, activate the sensor at least 2 times.

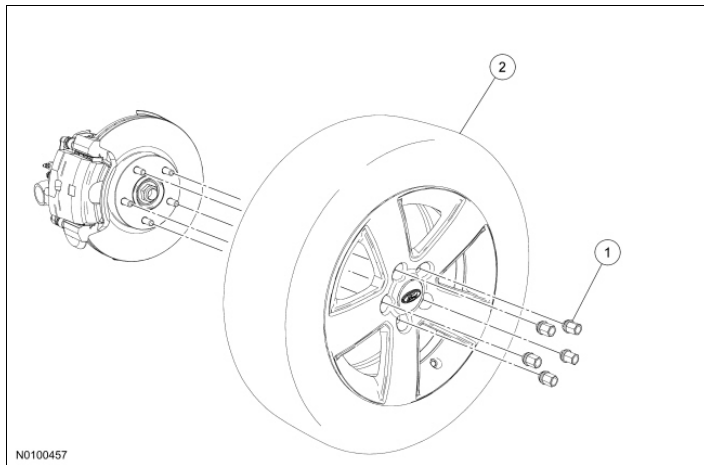
4. Repeat Steps 2 and 3 for the remaining tires.
  5. If the Tire Pressure Monitoring System (TPMS) indicator remains illuminated after adjusting and activating each sensor, refer to the Symptom Chart in Diagnosis and Testing in this section.
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## Wheel and Tire

### Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	-

**NOTE:** Typical 5 lug wheel shown.



Item	Part Number	Description
1	1012	Wheel nut (5 required)
2	-	Wheel and tire assembly

### Removal

1. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with fire suppression system, depower the system.

2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .
3. **NOTICE:** Do not use heat to loosen a seized wheel nut or damage to the wheel and wheel bearing can occur.  
  
Remove the 5 wheel nuts.
4. Remove the wheel and tire assembly.

### Installation

#### Wheel and Tire

1. **⚠ WARNING:** When a wheel is installed, always remove any corrosion, dirt or foreign material present on the mounting surface of the wheel and the mounting surface of the wheel hub, brake drum or brake disc. Make sure that any fasteners that attach the rotor to the hub are secured so they do not interfere with the mounting surfaces of the wheel. Failure to follow these instructions when installing wheels may result in the wheel nuts loosening and the wheel coming off while the vehicle is in motion, which could result in loss of control, leading to serious injury or death to vehicle occupant(s).

**NOTICE:** Make sure to apply a thin coat of anti-seize lubrication only to the interface between the wheel pilot bore and the hub pilot. Do not allow the anti-seize to make contact with the wheel-to-brake disc/drum mounting surface, wheel studs, wheel nuts, brake pads or brake disc friction surfaces or damage to components may occur.

Clean the wheel mounting surfaces and apply a thin coat of anti-seize to the wheel hub pilot surface (wheel only).

2. Install the wheel and tire assembly.
3. **⚠ WARNING:** Retighten wheel nuts within 160 km (100 mi) after a wheel is reinstalled. Wheels can loosen after initial tightening. Failure to follow this instruction may result in serious injury to vehicle occupant(s).

**NOTICE:** Failure to tighten the wheel nuts in a star/cross pattern can result in high brake disc runout, which will speed up the development of brake roughness, shudder and vibration.

**NOTE:** The wheel nut torque specification is for clean, dry wheel stud and wheel nut threads.

Install the 5 wheel nuts by hand.

- Tighten the wheel nuts in a star/cross pattern to 135 Nm (100 lb-ft).

4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with fire suppression system, repower the system.

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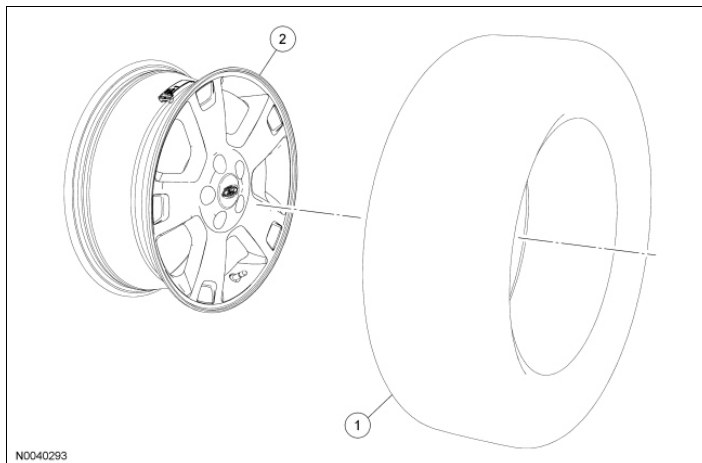




**Wheel and Tire**

## Special Tool(s)

 ST2869-A	Digital Tire Pressure Gauge 204-354
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Item	Part Number	Description
1	1508	Tire
2	1007	Wheel

**Disassembly**

**NOTICE:** Failure to follow the instructions below may result in damage to the Tire Pressure Monitoring System (TPMS) sensor.

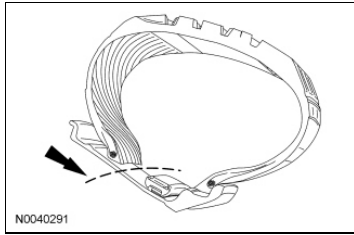
**NOTE:** Use only the Digital Tire Pressure Gauge any time tire pressures are measured to be sure that accurate values are obtained.

**NOTE:** A wheel and tire equipped with a Tire Pressure Monitoring System (TPMS) sensor will have the following verbiage stamped or cast on the wheel: SENSOR MAY BE INSIDE.  An animated version of this procedure is available on-line.

**NOTE:** The TPMS sensor is mounted to the wheel 180 degrees opposite of the valve stem and is held in place by a stainless steel strap. The sensor is not mounted to the valve stem.

1. Remove the wheel and tire. For additional information, refer to Wheel and Tire in this section.

**NOTICE:** Do not allow the tire beads to move beyond the wheel mid-plane (middle of the wheel) when separating the beads from the wheels, damage to the Tire Pressure Monitoring System (TPMS) sensor may occur.

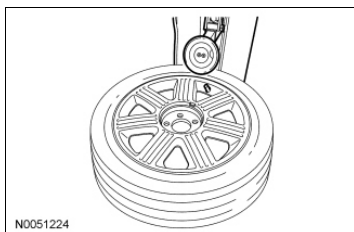
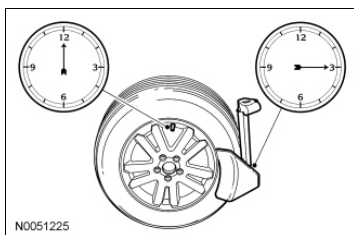


2. **NOTICE:** Tire and valve stem position is critical to prevent damage to the Tire Pressure Monitoring System (TPMS) sensor when using a paddle-type bead separator. An animated version of this procedure is available on-line.

**NOTE:** Some machines may have a nylon roller bead separator at the 12 o'clock position instead of the paddle-type bead separator at the 3 o'clock position. An animated version of this procedure is available on-line.

Position the wheel and tire assembly on a suitable tire machine and separate both beads of the tire from the wheel.

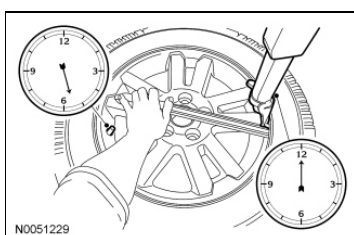
- For a paddle-type tire machine, position the valve stem at the 12 o'clock or 6 o'clock position and the paddle at the 3 o'clock position.
- For a roller-type tire machine, align the valve stem with the roller at any position.



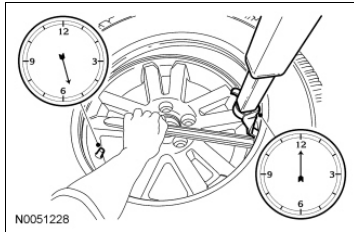
3. **NOTE:** A video version of this procedure is available on-line.

**NOTE:** Index-mark the valve stem and wheel weight positions on the tire.

Place the wheel and tire assembly on the turntable of the tire machine with the valve stem between the 5 o'clock and 6 o'clock positions and the machine arm at the 12 o'clock position and dismount the outer bead from the wheel.



4. Reset the wheel and tire assembly on the turntable of the tire machine with the valve stem between the 5 o'clock and 6 o'clock positions and the machine arm at the 12 o'clock position and dismount the inner bead from the wheel.




5. Inspect the TPMS sensor, cradle and strap for damage. Install new parts as necessary.
  - For information on removal and installation of the TPMS sensor, refer to Tire Pressure Monitoring System (TPMS) Sensor in this section.
  - When installing a new wheel, reuse the TPMS sensor from the previous wheel if possible. The TPMS will not have to be trained if the sensor is reused. The new wheel will not come with a sensor strap. A sensor strap kit will need to be ordered with the new wheel.

### Assembly


**NOTICE:** Damage to the Tire Pressure Monitoring System (TPMS) sensor may result if the tire mounting is not carried out as instructed.

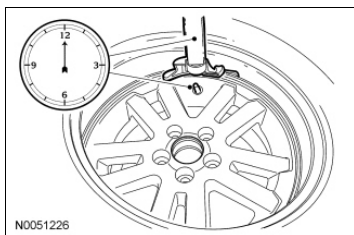
1. **NOTICE:** Lubricate the tire beads using a suitable fast drying, corrosion-inhibiting tire bead lubricant. Use of anything other than tire bead lubricant may result in damage to the Tire Pressure Monitoring System (TPMS) sensor.

**NOTE:** Do not mount the tire at this time.

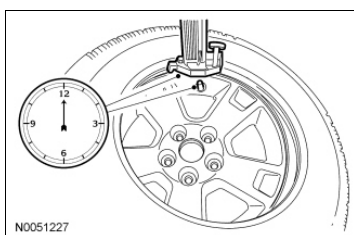
**NOTE:**  A video version of this procedure is available on-line.

Position the wheel on the turntable of the tire machine, then lubricate and position the bottom bead of the tire on the wheel.

2. Position the wheel to align the valve stem with the machine arm at the 12 o'clock position and mount the bottom bead of the tire.  A video version of this procedure is available on-line.




3. Reposition the wheel to align the valve stem with the machine arm at the 12 o'clock position and mount the top bead of the tire.



4. **NOTE:** Use only the Digital Tire Pressure Gauge any time tire pressures are measured to make sure that accurate values are obtained.

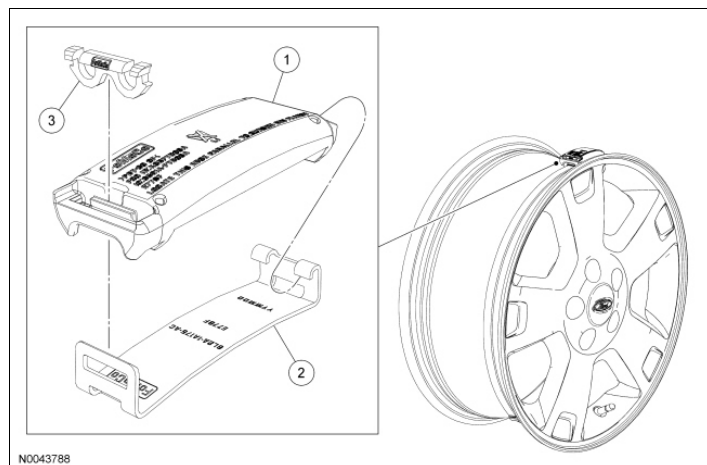
Using the Digital Tire Pressure Gauge, inflate the tire to the pressure specified on the Vehicle Certification (VC) label located on the driver door or door pillar.

- Proceed to Step 5 if the tire beads do not seat at the specified inflation pressure.

5.  **WARNING:** If there is a need to exceed the maximum pressure indicated on the sidewall of the tire, in order to seat the beads, follow ALL the steps listed below. Failure to follow these steps may result in serious personal injury.

**The following steps should only be carried out if the tire beads cannot be seated by inflating the tire up to the maximum inflation pressure listed on the tire sidewall.**

1. Relubricate the tire bead and wheel bead seat area.
  2. Install a remote valve and pressure gauge.
  3. Wear eye and ear protection and stand at a minimum of 3.65 m (12 ft) away from the wheel and tire assembly.
  4. Inflate tire using the remote valve and pressure gauge until the beads have seated or until the pressure gauge is 138 kPa (20 psi) more than maximum inflation pressure on tire sidewall. If beads have not seated, deflate the tire and proceed to the next step.
  5. Place the wheel and tire assembly in an OSHA-approved tire safety cage.
  6. Inflate the tire using the remote valve and pressure gauge until the beads have seated or until the pressure gauge is 276 kPa (40 psi) more than maximum inflation pressure on the tire sidewall. **Do not exceed 276 kPa (40 psi) above the maximum pressure on tire sidewall. Install a new tire if the beads do not seat at this pressure.**
6. Install the wheel and tire. For additional information, refer to Wheel and Tire in this section.
-

**Tire Pressure Monitoring System (TPMS) Sensor**

Item	Part Number	Description
1	1A150/1A189	Tire pressure sensor/sensor kit
2	1A175	Sensor cradle
3	14C202	Locking clip (also part of 1A189)

**Disassembly**

**⚠ WARNING:** The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.

**NOTE:** Tire pressure sensors are equipped with Lithium-ion batteries and must be disposed of accordingly.

**NOTE:** Tire pressure sensors are manufactured in multiple colors based on their application. When installing a new sensor, make sure the color of the sensor being installed matches the color of the sensor that was removed. The different colored sensors are **not** interchangeable.

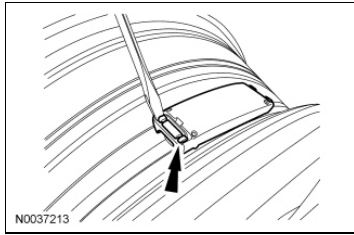
**NOTE:** The sensor can be removed and installed without removing the strap or the cradle.

1. **NOTICE:** The sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Dismount the tire only as instructed.


Remove the tire from the wheel. For additional information, refer to [Wheel and Tire](#) in this section.

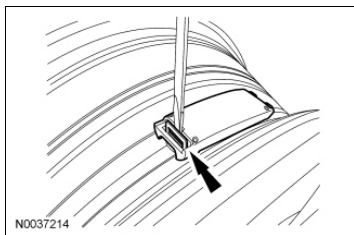
2. **NOTICE:** Do not use a large screwdriver. Apply minimum force during removal or damage to the sensor locking clip may occur.

Using a pocket screwdriver or similar tool, remove the sensor locking clip. ➡ An animated version of this procedure is available on-line.



3. **NOTICE:** Do not use a large screwdriver. Apply minimum force during removal or damage to the sensor may occur.

Using a pocket screwdriver or similar tool, detach the sensor from the cradle.  An animated version of this procedure is available on-line.



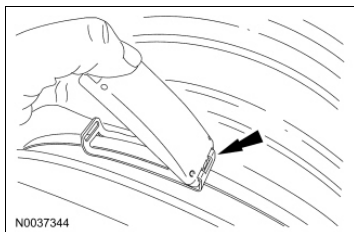
4. Remove the sensor.

## Assembly

1. **NOTICE:** Damage to the sensor may occur if excessive force is applied during sensor installation.

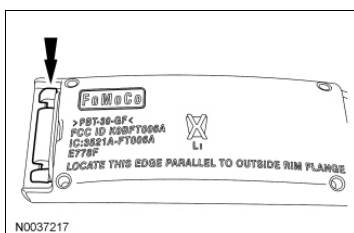
**NOTE:** Make sure the sensor is fully seated into the cradle. The sensor will make a "click" noise when correctly seated.

Position the sensor into the cradle by inserting the hinge end of the sensor into the hook end of the cradle and pushing the opposite end of the sensor down onto the cradle.



2. **NOTE:** The locking clip can only be fully seated when installed in the correct orientation. If the sensor locking clip cannot be fully inserted, then the sensor may not be fully seated on the cradle or the locking clip may be inserted backward.

Insert a new locking clip into the sensor.



3. **NOTICE:** The sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Mount the tire only as instructed.

Install the tire onto the wheel. For additional information, refer to Wheel and Tire in this section.

4. **NOTE:** A new tire pressure sensor is shipped in an off mode (or battery saver mode) and must be turned on before it can be trained. To turn the sensor on, install it on a wheel, mount the tire and inflate the tire to the recommended inflation pressure. Wait at least 2 minutes, then continue with the sensor training procedure.

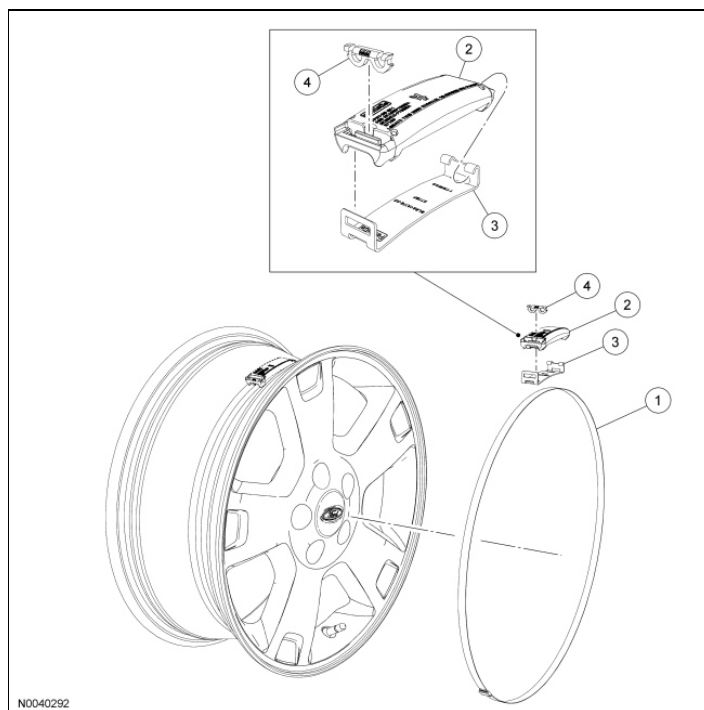
Train the tire pressure sensor(s). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

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**Tire Pressure Monitoring System (TPMS) Strap and Cradle**

## Material

Item	Specification
Motorcraft® Wheel and Tire Cleaner ZC-37-A	-



Item	Part Number	Description
1	1A177/1A193	Strap/strap kit
2	1A150/1A189	Tire pressure sensor/sensor kit
3	1A175	Sensor cradle (also part of 1A193)
4	14C202	Locking clip (also part of 1A189)

**Disassembly**

**⚠ WARNING:** The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.

**NOTE:** Tire pressure sensors are equipped with Lithium-ion batteries and must be disposed of accordingly.

**NOTE:** Tire pressure sensors are manufactured in multiple colors based on their application. When installing



a new sensor, make sure the color of the sensor being installed matches the color of the sensor that was removed. The different colored sensors are **not** interchangeable.

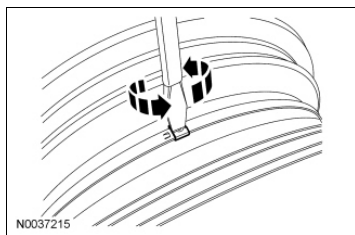
**NOTE:** The sensor is available separately, the cradle and strap are available as a strap kit. There are several different strap kits available based on wheel diameter, but all strap kits share the same base part number.

1. Remove the Tire Pressure Monitoring System (TPMS) sensor. For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor in this section.
2. **⚠ WARNING: Always wear eye protection when servicing a vehicle. Failure to follow this instruction may result in serious personal injury.**


**⚠ WARNING: Wear protective gloves when handling components or parts that have pointed or sharp edges. Failure to follow this instruction may result in serious personal injury.**

Remove a factory-installed strap in the following sequence:

1. Locate the strap buckle and secure the strap to the wheel using duct tape or a similar item on both sides of the buckle, approximately 25 mm (0.98 in) from the buckle.
2. Using a large screwdriver and a twisting motion, unbuckle the strap.
3. Discard the strap.



3. To remove a dealer-installed strap, turn the worm gear screw until the strap is fully released from the worm gear.
  - Discard the strap.
4. **NOTE:** To aid assembly, mark the location of the cradle prior to disassembly.

Using a screwdriver, or similar tool, remove the cradle by inserting the screwdriver under the cradle and prying up.  An animated version of this procedure is available on-line.

## Assembly

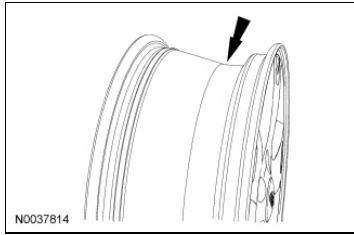
1. **NOTE:** Make sure the sensor is fully seated into the new cradle. The sensor will make a "click" noise when fully seated.

Position the sensor into the new cradle by inserting the hinge end of the sensor into the hook end of the cradle and pushing the opposite end of the sensor down onto the cradle.

2. **NOTICE: Metal scrapers may damage the wheel. Use only plastic or non-metallic scrapers to remove the cradle adhesive strip residue.**


**NOTE:** The sensor and cradle must be installed in the drop well of the wheel, 180 degrees from the valve stem.

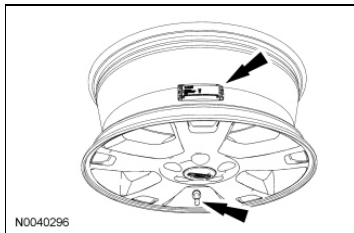
Using wheel and tire cleaner, clean the area where the sensor and cradle are to be installed.




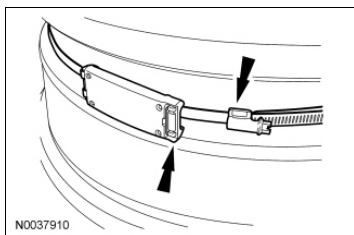
3. **NOTE:** The sensor and cradle must be positioned with the hinge side of the sensor on the RH side when viewed from the curb side (beauty side) of the wheel.

**NOTE:** The sensor has raised markings indicating how to position the sensor.

Remove the adhesive tape liner from the cradle and position the sensor and cradle into the wheel drop well 180 degrees from the valve stem.  A video version of this procedure is available on-line.



4. Install the tapered end of the strap through the opening of the cradle on the hinge side of the sensor. This will position the worm gear on the locking clip side of the sensor.  An animated version of this procedure is available on-line.

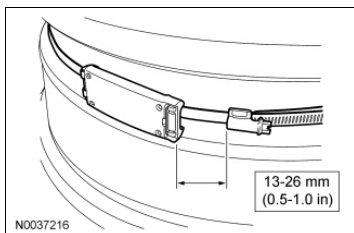


5. **NOTICE:** Steel wheels have a "high spot" along their circumference. Make sure the strap and sensor are mounted at the lowest spot possible to avoid damaging the sensor during wheel and tire disassembly and assembly.

**NOTE:** Keep the strap parallel with the wheel flange while tightening the worm gear.

Position the worm gear 13-26 mm (0.5-1.0 in) away from the sensor and tighten the worm gear.

- Tighten to 3 Nm (27 lb-in).



6. **NOTICE:** The sensor, cradle and strap may be damaged by incorrect tire mounting or dismounting. Mount the tire only as instructed.

Install the tire onto the wheel. For additional information, refer to Wheel and Tire in this section.

7. **NOTE:** A new tire pressure sensor is shipped in an off mode (or battery saver mode) and must be turned on before it can be trained. To turn the sensor on, install it on a wheel, mount the tire and inflate the tire to the recommended inflation pressure. Wait at least 2 minutes, then continue with the sensor training procedure.

Train the tire pressure sensor(s). For additional information, refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.

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## Material

Item	Specification	Fill Capacity
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-

## Torque Specifications

Description	Nm	lb-ft	lb-in
Air suspension compressor bracket nuts	5	-	44
Air suspension compressor drier screw	3	-	27
Height sensor bracket bolts	25	18	-
Height sensor bracket nuts (Inner)	11	-	97
Height sensor bracket nuts (Outer)	12	-	106

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**Vehicle Dynamic Suspension**

The vehicle dynamic suspension consists of the following components:





- Air compressor
- Air spring
- Air suspension height sensor (rotary type)
- Air suspension switch
- Air tubes
- Compressor drier
- Solenoid valve
- Vehicle Dynamics Module (VDM)
- Wheel studs

The vehicle dynamic suspension system uses an electric pump to pressurize air springs which replace the traditional coil springs. The programmed vehicle ride height is controlled by a VDM which receives a signal from suspension mounted height sensors. The purpose of the vehicle dynamic system is to provide smooth ride quality and a self-leveling suspension. A switch allows for the system to be turned ON or OFF.

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**Vehicle Dynamic Suspension**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU-77-4 or equivalent
 ST2574-A	Flex Probe Kit 105-R025B or equivalent
 ST1176-A	Vacuum Tester 014-R1054 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation**

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Any air spring which is unfolded must be refolded prior to being installed in a vehicle. Refer to the procedure in this section. An incorrectly folded air spring could rupture, altering the handling characteristics of the vehicle. If a vehicle has been driven with an incorrectly folded air spring, a new air spring must be installed. Failure to follow these instructions may result in serious injury to vehicle occupant(s).

**⚠ WARNING:** Inspect the air spring for correct shape after it has been inflated with the wheels off the ground and the suspension unloaded. A deformed air spring could fail. Failure to follow this instruction may result in serious injury to the technician or vehicle occupant(s).

**⚠ WARNING:** Always inflate air springs before loading the suspension. If a load is applied to an uninflated air spring, the spring may be damaged and a new air spring will have to be installed. Damaged springs degrade vehicle handling, which could result in serious injury to vehicle occupant(s).

**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

The air suspension system is designed to improve ride handling and general vehicle driving performance.

**Vehicle Dynamics Module (VDM)**

**NOTE:** Before diagnosing the air suspension system, carry out the Vehicle Dynamics Module (VDM) self-test. If a DTC is present, follow the diagnosis and testing procedures. If no DTC is present, check the vehicle ride height by following the ride height adjustment procedure in this section.

If the system cannot reach the correct ride height, check all of the air tubes and connections for leaks, blockage or damage, height sensor integrity and/or compressor relay operation before installing a new air compressor.

A microprocessor controls the air suspension system. The microprocessor and supporting hardware are contained in the VDM . The VDM responds to signals from various sensors in the vehicle to maintain the programmed ride height while the vehicle is either moving or stopped. The VDM accomplishes this by opening and closing solenoid valves to control the amount of air in the air spring(s). The VDM turns on the compressor by applying voltage through the compressor relay to inflate the air spring(s) and raise the vehicle. The VDM opens the vent solenoid to lower the vehicle by releasing air from the air spring(s) in response to signal inputs from the air suspension height sensor. The VDM has a preprogrammed trim height.

### Air Suspension Switch

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

In the ON position, the air suspension switch provides a signal to the VDM which, in turn, deactivates the system. In the OFF position, the air suspension switch interrupts this signal to the VDM which, in turn, deactivates the system to maintain the vehicle height.

### Air Compressor

**NOTE:** The compressor contains a thermal overload circuit breaker. The circuit breaker automatically resets after a cool-down period and after being tripped by excessive compressor motor heat.

The air compressor assembly consists of the compressor pump, electric motor vent solenoid and driver (must be installed as an assembly).

### Air Suspension Rotary Height Sensor

One air suspension height sensor is mounted on the vehicle. The air suspension height sensor sends a voltage signal to the VDM . The output ranges from approximately 4.5 volts at minimum height (when the vehicle is low or in full jounce) to 0.5 volt at maximum height (when the vehicle is high or in full rebound). Install a new air suspension height sensor as a unit.

When the air suspension height sensor indicates that the rear of the vehicle is lower than trim height under normal driving conditions, the air compressor will turn on and pump compressed air into the air springs. When the sensor indicates that the rear of the vehicle is raised above trim under normal driving conditions, this will cause the air to be vented from the air springs to lower the vehicle back to its trim height level.

### Solenoid Valve, Air Spring

**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

The air spring solenoid valve allows air to enter and exit the rear air springs during height adjustment

operations. The air spring solenoid valve is electrically operated and controlled by the VDM .

### Inspection and Verification

**NOTE:** Before diagnosing the air suspension system, carry out the VDM self-test. If a DTC is present, follow the diagnosis and testing procedures. If no DTC is present, check the vehicle ride height by following the ride height adjustment procedure in this section.

If the system cannot reach the correct ride height, check all of the air tubes and connections for leaks, blockage or damage, height sensor integrity and/or compressor relay operation before installing a new air compressor.

1. Verify the customer concern.
2. **NOTE:** If the door ajar indicator is illuminated, repair the door ajar indicator. Refer to Section 413-01 .

Visually inspect for obvious signs of mechanical and electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Restricted suspension movement</li> <li>• Excessive vehicle load</li> <li>• Cut, severed or crimped air tube(s)</li> <li>• Incorrectly mounted, damaged or disconnected height sensor</li> <li>• Damaged air spring(s)</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse 13 (10A)</li> <li>• Battery Junction Box (BJB) fuses:               <ul style="list-style-type: none"> <li>◆ 5 (10A)</li> <li>◆ 112 (30A)</li> </ul> </li> <li>• Wiring, terminals or connectors</li> <li>• Air suspension switch</li> <li>• Damaged air spring solenoid(s)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The VDM LED prove out confirms power and ground from the DLC are provided to the VCM.

If the scan tool does not communicate with the VDM :

- check the VDM connection to the vehicle.
- check the scan tool connection to the VDM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:



- verify the ignition key is in the ON position.
  - verify the scan tool operation with a known good vehicle.
  - refer to [Section 418-00](#) to diagnose no response from the PCM.
7. Carry out the network test.
- If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#).
  - If the network test passes, retrieve and record continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the VDM.
9. If the DTCs retrieved are related to the concern, go to Vehicle Dynamics Module (VDM) DTC Chart. For all other DTCs, refer to [Section 419-10](#).
10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#).

### Vehicle Dynamics Module (VDM) DTC Chart

**NOTE:** If VDM C2131b is disconnected before VDM C2131a, DTCs C1830, C1770, C1790 and C1795 will be set and must be cleared before an accurate list of continuous DTCs can be retrieved.

### Vehicle Dynamics Module (VDM) DTC Chart

DTC	Description	Source	Action
B1317	Battery Voltage High	Vehicle Dynamics Module (VDM)	<a href="#">GO to Pinpoint Test A</a> .
B1318	Battery Voltage Low	VDM	<a href="#">GO to Pinpoint Test A</a> .
B1342	Electronic Control Unit (ECU) is Defective	VDM	INSTALL a new VDM. REFER to <a href="#">Vehicle Dynamics Module (VDM)</a> in this section. TEST the system for normal operation.
B1566	Door Ajar Circuit Short to Ground	VDM	DTC B1566 indicates that the door is ajar and the module is unable to enter the self-test. CLOSE all doors and CARRY OUT the self-test.  If DTC B1566 returns, REFER to <a href="#">Section 417-02</a> .
B2477	Module Configuration Failure	VDM	RECONFIGURE the module. REFER to Programmable Module Installation (PMI) in <a href="#">Section 418-01</a> . REPEAT the self-test.  If DTC B2477 returns, INSTALL a new VDM. REFER to <a href="#">Vehicle Dynamics Module (VDM)</a> in this section. TEST the system for normal operation.
C1724	Air Suspension Height Sensor Power Circuit Failure	VDM	<a href="#">GO to Pinpoint Test B</a> .
C1726	Air Suspension Rear Pneumatic Failure	VDM	<a href="#">GO to Pinpoint Test C</a> .

C1770	Air Suspension Vent Solenoid Output Circuit Failure	VDM	<u>GO to Pinpoint Test E .</u>
C1790	Air Suspension LR Air Spring Solenoid Output Circuit Failure	VDM	<u>GO to Pinpoint Test F .</u>
C1795	Air Suspension RR Air Spring Solenoid Output Circuit Failure	VDM	<u>GO to Pinpoint Test F .</u>
C1830	Air Suspension Compressor Relay Circuit Failure	VDM	<u>GO to Pinpoint Test G .</u>
C1840	Air Suspension Disable Switch Circuit Failure	VDM	<u>GO to Pinpoint Test H .</u>
C1885	Air Suspension RR Height Sensor Circuit Failure	VDM	<u>GO to Pinpoint Test D .</u>
C1964	Air Suspension Air Compressor Request Exceeded Maximum Timing	VDM	DTC C1964 indicates that the air compressor has overheated and is unable to enter the self-test. ALLOW the air compressor to cool down for approximately 5 minutes. If other DTCs are present, REPAIR as necessary before clearing the DTCs. REFER to the corresponding DTC in this chart. CLEAR the DTC. REPEAT the self-test.
U0073	Control Module Communication Bus A Off	VDM	REFER to <u>Section 418-00</u> to diagnose the no communication concern.
U0100	Lost Communication With Electronic Control Unit (ECU)/PCM	VDM	REFER to <u>Section 418-00</u> to diagnose the no communication concern.
U0155	Lost Communication With Instrument Panel Cluster	VDM	REFER to <u>Section 418-00</u> to diagnose the no communication concern.
U2011	Module Transmitted Invalid Data, Non Standard Corporate Protocol (SCP)	VDM	CLEAR the DTC. REPEAT the self-test.  If DTC U2011 returns, INSTALL a new VDM. REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. TEST the system for normal operation.
U2050	Application Not Present	VDM	INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. TEST the system for normal operation.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

**Pinpoint Test A: DTC B1317/B1318**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

**Normal Operation**

Fused ignition switch voltage is provided to the Vehicle Dynamics Module (VDM) from Central Junction Box (CJB) fuse 13 (10A) along circuit 1003 (GY/YE). Fused battery voltage is provided to the VDM from battery junction box (BJB) fuse 5 (10A) along circuit 418 (DG/YE). Ground for the VDM is provided along circuit 57 (BK) and the VDM communicates with the other modules on the Controller Area Network (CAN) bus along circuits 1828 (PK/LG) and 1827 (WH/LG).

- DTC B1317 (Battery Voltage High) - With the ignition key in the RUN position, if battery voltage exceeds 18 volts for more than 500 ms, DTC B1317 will be set.
- DTC B1318 (Battery Voltage Low) - With the ignition key in the RUN position, if battery voltage falls below 8.5 volts for more than 500 ms, DTC B1318 will be set.

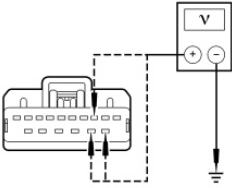
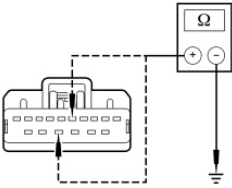
**This pinpoint test is intended to diagnose the following:**

- Fuse(s)
- Wiring, terminals or connectors
- VDM

**PINPOINT TEST A: DTC B1317/B1318**

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>A1 CHECK THE BATTERY VOLTAGE</b>	
<p><b>NOTE:</b> A recent jump start can cause these DTCs to set.</p> <ul style="list-style-type: none"> <li>• Measure the battery voltage between the positive and negative battery posts with the Key ON Engine OFF (KOEO) and with the engine running.</li> <li>• <b>Is the battery voltage between 10 and 13 volts with KOEO , and between 11 and 17 volts with the engine running?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> REFER to Diagnosis and Testing in <u>Section 414-00</u> .</p>
<b>A2 CHECK FOR VOLTAGE TO THE VDM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: VDM C2131a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and: <ul style="list-style-type: none"> <li>◆ VDM C2131a-3, circuit 1003 (GY/YE), harness side.</li> <li>◆ VDM C2131a-11, circuit 418 (DG/YE), harness side.</li> <li>◆ VDM C2131a-12, circuit 418 (DG/YE), harness side.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> VERIFY CJB fuse 13 (10A) is OK. If OK, REPAIR circuit 1003 (GY/YE). If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p> <p>VERIFY BJB fuse 5 (10A) is OK. If OK, REPAIR circuit 418 (DG/YE). If not OK,</p>

 <p>N0055980</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts and less than 17 volts?</li> </ul>	<p>REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p> <p>CLEAR the DTCs. REPEAT the self-test.</p>
<b>A3 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and:             <ul style="list-style-type: none"> <li>◆ VDM C2131a-14, circuit 57 (BK), harness side.</li> <li>◆ VDM C2131a-5, circuit 57 (BK) harness side.</li> </ul> </li> </ul>  <p>N0055981</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> REPAIR circuit 57 (BK). CLEAR the DTCs. REPEAT the self-test.</p>

**Pinpoint Test B: DTC C1724**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

**Normal Operation**

The Vehicle Dynamics Module (VDM) sends power to the height sensor along circuit 417 (VT/OG) and the voltage returns along circuit 432 (BK/PK). The sensor sends the position signal back to the VDM along circuit 427 (PK/BK).

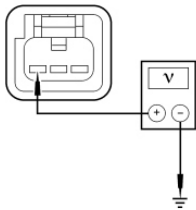
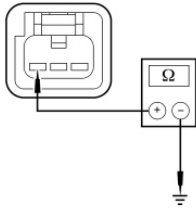
- DTC C1724 (Air Suspension Height Sensor Power Circuit Failure) - This DTC can be set during normal operation and during the VDM on-demand self test. DTC C1724 will set during normal operation if the ignition key is in the RUN position and the height sensor supply voltage is not at the expected level for more than 2 minutes. DTC C1724 will set during the on-demand self test if the height sensor voltage is not detected after being enabled during the test.

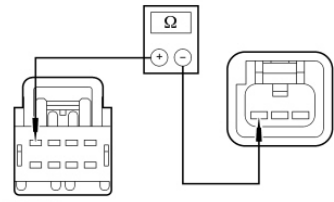
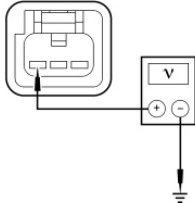
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Air suspension height sensor
- VDM

## PINPOINT TEST B: DTC C1724

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>B1 CHECK CIRCUIT 417 (VT/OG) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: VDM C2131b.</li> <li>• Disconnect: Air Suspension Height Sensor C4043.</li> <li>• Turn the air suspension switch to the OFF position.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between air suspension height sensor C4043-3, circuit 417 (VT/OG), harness side and ground.</li> </ul>  <p><b>• Is any voltage present?</b></p>	<p><b>Yes</b> REPAIR circuit 417 (VT/OG). CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> GO to <u>B2</u> .</p>
<b>B2 CHECK CIRCUIT 417 (VT/OG) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between air suspension height sensor C4043-3, circuit 417 (VT/OG), harness side and ground.</li> </ul>  <p><b>• Is the resistance greater than 10,000 ohms?</b></p>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> REPAIR circuit 417 (VT/OG). CLEAR the DTC. REPEAT the self-test.</p>
<b>B3 CHECK CIRCUIT 417 (VT/OG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between VDM C2131b-4, circuit 417 (VT/OG), harness side and air suspension height sensor C4043-3, circuit 417 (VT/OG), harness side.</li> </ul>	<p><b>Yes</b> REPAIR circuit 417 (VT/OG). CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> GO to <u>B4</u> .</p>

 <p>N0055983</p> <p>• Is the resistance greater than 5 ohms?</p>	
<b>B4 CHECK THE VDM OUTPUT</b>	
<ul style="list-style-type: none"> <li>• Connect: VDM C2131b.</li> <li>• Ignition ON.</li> <li>• Turn the air suspension switch to the ON position.</li> <li>• Measure the voltage between air suspension height sensor C4043-3, circuit 417 (VT/OG), harness side and ground.</li> </ul>  <p>N0055970</p> <p>• Is the voltage approximately 5 volts?</p>	<p><b>Yes</b>  <b>INSTALL</b> a new air suspension height sensor. REFER to <u>Suspension Height Sensor</u> in this section. <b>CLEAR</b> the DTC. <b>REPEAT</b> the self-test.</p> <p><b>No</b>  <b>INSTALL</b> a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. <b>CLEAR</b> the DTC. <b>REPEAT</b> the self-test.</p>

## Pinpoint Test C: DTC C1726

### Normal Operation

The air suspension height sensor sends a voltage signal to the Vehicle Dynamics Module (VDM). The output ranges from approximately 4.5 volts at minimum height (when the vehicle is low or in full jounce) to 0.5 volt at maximum height (when the vehicle is high or in full rebound).

When the air suspension height sensor indicates that the rear of the vehicle is lower than trim height under normal driving conditions, the air compressor will turn on and pump compressed air into the air springs. When the sensor indicates that the rear of the vehicle is raised above trim under normal driving conditions, this will cause the air to be vented from the air springs to lower the vehicle back to its trim height level.

- DTC C1726 (Air Suspension Rear Pneumatic Failure) - With the ignition key in the RUN position, DTC C1726 will be set if the air suspension system attempts and fails to inflate (pump) or deflate (vent) a specified number of times.

#### **This pinpoint test is intended to diagnose the following:**

- Height sensor brackets
- Air tube
- Air suspension height sensor
- Air spring solenoid valve
- Air suspension compressor drier
- Air suspension compressor
- VDM

**PINPOINT TEST C: DTC C1726**

**NOTE:** Repair all other DTCs before repairing DTC C1726.

**NOTE:** It may be necessary to partially vent air from the air springs during this pinpoint test.

Test Step	Result / Action to Take
<b>C1 CHECK THE AIR SUSPENSION HEIGHT SENSOR MOUNTING</b>	
<ul style="list-style-type: none"> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Check the air suspension height sensor for correct installation at the upper and lower ball stud brackets.</li> <li>• Check the air suspension height sensor mounting brackets for damage.</li> <li>• <b>Are the air suspension height sensor and mounting brackets OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> REPAIR as necessary. CLEAR the DTC. REPEAT the self-test.</p>
<b>C2 CHECK THE AIR SUSPENSION HEIGHT SENSOR (RR_HEIGHT) PID</b>	
<ul style="list-style-type: none"> <li>• Lower the vehicle.</li> <li>• Disconnect the lower end of the air suspension height sensor link.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• Monitor the RR_HEIGHT PID while slowly moving the air suspension height sensor through its full range of motion.</li> <li>• <b>Does the height sensor PID display vary from 0.5 volt to 4.5 volts?</b></li> </ul>	<p><b>Yes</b> CONNECT the lower end of the height sensor link. GO to <u>C3</u> .</p> <p><b>No</b> INSTALL a new air suspension height sensor. REFER to <u>Suspension Height Sensor</u> in this section. CLEAR the DTC. REPEAT the self-test.</p>
<b>C3 VERIFY THAT THE REAR OF THE VEHICLE CAN BE RAISED</b>	
<ul style="list-style-type: none"> <li>• Record the voltage level for the air suspension height sensor.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• <b>NOTE:</b> If the air spring solenoids are not activated before the compressor is activated, the vent solenoid will automatically activate.</li> <li>• Toggle the following output commands ON: <ul style="list-style-type: none"> <li>◆ Left Rear Air Spring Solenoid (LR_SOL)</li> <li>◆ Right Rear Air Spring Solenoid (RR_SOL)</li> <li>◆ Air Compressor (COMPRESSOR)</li> </ul> </li> <li>• Allow the rear of the vehicle to raise for only 30 seconds.</li> <li>• <b>Does the rear of the vehicle raise and hold the new height?</b></li> </ul>	<p><b>Yes</b> TOGGLE all output commands OFF. GO to <u>C4</u> .</p> <p><b>No</b> TOGGLE all output commands OFF. GO to <u>C5</u> .</p>

<b>C4 VERIFY THAT THE REAR OF THE VEHICLE CAN BE LOWERED</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• Toggle the following output commands ON:             <ul style="list-style-type: none"> <li>◆ Left Rear Air Spring Solenoid (LR_SOL)</li> <li>◆ Right Rear Air Spring Solenoid (RR_SOL)</li> <li>◆ Air Suspension Vent Solenoid (AsVent)</li> </ul> </li> <li>• Allow the rear to lower until the rear air suspension height sensor voltage reading matches the one recorded in Step C3 or until 30 seconds have passed.</li> <li>• <b>Does the rear of the vehicle lower?</b></li> </ul>	<p><b>Yes</b> TOGGLE all output commands OFF. CLEAR the DTCs. REPEAT the self-test and CARRY OUT the Pneumatic Test in this section.</p> <p><b>No</b> TOGGLE all output commands OFF. GO to <u>C7</u> .</p>
<b>C5 CHECK THE AIR COMPRESSOR (COMPRESSOR) OUTPUT COMMAND</b>	
<p><b>NOTICE: Do not allow the air compressor to run for more than 3 minutes. The air compressor could overheat and stop operation due to an internal temperature sensitive thermal breaker.</b></p> <ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• Toggle the air compressor to ON.</li> <li>• <b>Does the air compressor run?</b></li> </ul>	<p><b>Yes</b> TOGGLE all output commands OFF. GO to <u>C6</u> .</p> <p><b>No</b> TOGGLE all output commands OFF. <u>GO to Pinpoint Test I</u> .</p>
<b>C6 CHECK THE AIR COMPRESSOR PRESSURE OUTPUT</b>	
<p><b>NOTICE: The Vehicle Dynamics Module (VDM) limits the air compressor run time. If the air compressor overheats, it will not restart until it cools down. The ignition switch must be in the OFF position to allow the compressor thermal switch to cool.</b></p> <p><b>NOTE:</b> If fluid is present when disconnecting the air tube, clear the air tubes. Refer to <u>Air Line Fluid Purge</u> in this section. Check the compressor air drier for water or the air compressor for oil contamination.</p> <ul style="list-style-type: none"> <li>• Disconnect the air tube at the air compressor drier.</li> <li>• Connect an air gauge with a maximum reading of 1,723 kPa (205 psi) to the air drier using common fittings.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• Toggle the LR and RR air spring solenoids to ON.</li> <li>• <b>NOTE:</b> If the air spring solenoids are not activated before the compressor is activated, the vent solenoid will automatically activate.</li> <li>• Toggle the following output commands ON.             <ul style="list-style-type: none"> <li>◆ Left Rear Air Spring Solenoid (LR_SOL)</li> <li>◆ Right Rear Air Spring Solenoid (RR_SOL)</li> </ul> </li> </ul>	<p><b>Yes</b> TOGGLE all output commands OFF. GO to <u>C8</u> .</p> <p><b>No</b> TOGGLE all output commands OFF. INSTALL a new air suspension compressor. REFER to <u>Air Suspension Compressor</u> in this section. CLEAR the DTC. REPEAT the self-test.</p>



<ul style="list-style-type: none"> <li>♦ Air Compressor (COMPRESSOR)</li> <li>• Operate the air compressor for 30 seconds then toggle the air compressor OFF.</li> <li>• <b>Did the compressor produce 896 kPa (130 psi) within 30 seconds and hold the developed pressure?</b></li> </ul>	
<b>C7 CHECK THE PNEUMATIC SYSTEM - VENT THE AIR SPRINGS</b>	
<p><b>NOTE:</b> If fluid is present when disconnecting the air tube, clear the air tubes. Refer to <a href="#">Air Line Fluid Purge</a> in this section. Check the air compressor drier for water or the air compressor for oil contamination.</p> <p><b>NOTE:</b> The rear springs must be partially inflated in order to carry out this test. Add air as necessary.</p> <ul style="list-style-type: none"> <li>• Disconnect the air tube at the air compressor drier.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• <b>NOTE:</b> The vehicle will lower quickly.</li> <li>• Toggle the following output commands ON: <ul style="list-style-type: none"> <li>♦ Left Rear Air Suspension Solenoid (LR_SOL)</li> <li>♦ Right Rear Air Suspension Solenoid (RR_SOL)</li> </ul> </li> <li>• <b>Does the air vent from the air compressor drier air tube?</b></li> </ul>	<p><b>Yes</b> TOGGLE all output commands OFF. GO to <a href="#">C9</a> .</p> <p><b>No</b> TOGGLE all output commands OFF. CONNECT the air tube to the air compressor drier. GO to <a href="#">C8</a> .</p>
<b>C8 CHECK THE PNEUMATIC SYSTEM - AIR TUBE</b>	
<p><b>NOTE:</b> If fluid is present when disconnecting the air tube, clear the air tubes. Refer to <a href="#">Air Line Fluid Purge</a> . Check the air compressor drier for water or the air compressor for oil.</p> <ul style="list-style-type: none"> <li>• Disconnect the suspected rear air spring solenoid air tube.</li> <li>• Connect the vacuum tester to the air tube and try to pull a vacuum.</li> <li>• <b>Can a vacuum be developed?</b></li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new air tube. CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> INSTALL a new air spring solenoid valve. REFER to <a href="#">Air Spring Solenoid Valve</a> in this section. CLEAR the DTC. REPEAT the self-test.</p>
<b>C9 CHECK THE VENT SOLENOID (AsVent) PID</b>	
<ul style="list-style-type: none"> <li>• Disconnect the air tube at the drier.</li> <li>• Connect the vacuum tester to the drier and try to pull a vacuum.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger VDM .</li> <li>• Toggle the AsVent output command to ON.</li> <li>• Try to pull a vacuum again.</li> <li>• <b>Can a vacuum be developed with the vent solenoid OFF active command and no vacuum developed with the vent solenoid ON active command?</b></li> </ul>	<p><b>Yes</b> TOGGLE all output commands OFF. INSTALL a new VDM . REFER to <a href="#">Vehicle Dynamics Module (VDM)</a> in this section. REPEAT the self-test.</p> <p><b>No</b> TOGGLE all output commands OFF. If a vacuum cannot be developed with the vent solenoid OFF, GO to <a href="#">C11</a> .</p> <p>If a vacuum can be developed with the vent solenoid OFF, GO to <a href="#">C10</a> .</p>

<b>C10 CHECK THE AIR TUBE AND CONNECTIONS</b>	
<ul style="list-style-type: none"> <li>• Check the air tube and connections between the vacuum tester and the air compressor.</li> <li>• <b>Are the air tube and connections OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new air compressor. REFER to <u>Air Suspension Compressor</u> in this section. CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> REPAIR the air tube. CLEAR the DTC. REPEAT the self-test.</p>
<b>C11 CHECK THE AIR COMPRESSOR DRIER</b>	
<ul style="list-style-type: none"> <li>• Remove the air tube at the air compressor drier.</li> <li>• <b>NOTE:</b> Under normal operating conditions, the compressor drier should pull a vacuum and then slowly leak down. A drier is defective if it will not pull a vacuum or if it pulls a vacuum but fails to slowly leak down.</li> <li>• Connect the vacuum tester to the air compressor drier and try to pull a vacuum.</li> <li>• <b>Can a vacuum be developed, followed by a slow leak down?</b></li> </ul>	<p><b>Yes</b> INSTALL a new air compressor. REFER to <u>Air Suspension Compressor</u> in this section. CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> INSTALL a new air compressor drier. REFER to <u>Air Suspension Compressor Drier</u> in this section. CLEAR the DTC. REPEAT the self-test.</p>

**Pinpoint Test D: DTC C1885**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

**Normal Operation**

The Vehicle Dynamics Module (VDM) sends power to the height sensor along circuit 417 (VT/OG) and the voltage returns along circuit 432 (BK/PK). The sensor sends the position signal back to the VDM along circuit 427 (PK/BK).

- DTC C1885 (Air Suspension RR Height Sensor Circuit Failure) - With the ignition in the RUN position, if the height sensor is reading less than 0.5 volt or more than 4.5 volts, DTC C1885 will be set.

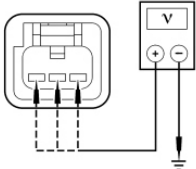
**This pinpoint test is intended to diagnose the following:**

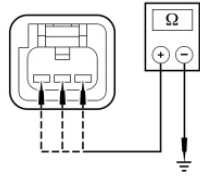
- Wiring, terminals or connectors
- Air suspension height sensor
- VDM

**PINPOINT TEST D: DTC C1885**

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>D1 CHECK THE HEIGHT SENSOR (RR_HEIGHT) PID</b>	

<ul style="list-style-type: none"> <li>• Turn the air suspension switch to the OFF position.</li> <li>• Disconnect the lower end of the air suspension height sensor link.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - VDM .</li> <li>• Monitor the RR_HEIGHT PID while slowly moving the air suspension height sensor through its full range of motion.</li> <li>• <b>Does the height sensor PID display vary from 0.5 volt to 4.5 volts?</b></li> </ul>	<p><b>Yes</b> An intermittent fault condition is indicated. INSPECT the height sensor electrical connector for corrosion and damage. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> CONNECT the lower end of the height sensor link. GO to <u>D2</u> .</p>
<p><b>D2 CHECK THE HEIGHT SENSOR CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: VDM C2131b.</li> <li>• Disconnect: Air Suspension Height Sensor C4043.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and: <ul style="list-style-type: none"> <li>◆ air suspension height sensor C4043-3, circuit 417 (VT/OG), harness side.</li> <li>◆ air suspension height sensor C4043-2, circuit 427 (PK/BK), harness side.</li> <li>◆ air suspension height sensor C4043-1, circuit 432 (BK/PK), harness side.</li> </ul> </li> </ul>  <p>N0105606</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>D3</u> .</p>
<p><b>D3 CHECK THE HEIGHT SENSOR CIRCUITS FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and: <ul style="list-style-type: none"> <li>◆ air suspension height sensor C4043-3, circuit 417 (VT/OG), harness side.</li> <li>◆ air suspension height sensor C4043-2, circuit 427 (PK/BK), harness side.</li> <li>◆ air suspension height sensor C4043-1, circuit 432 (BK/PK), harness side.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>D4</u> .</p> <p><b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.</p>



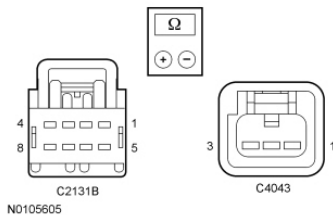
N0105607

- Are the resistances greater than 10,000 ohms?

#### D4 CHECK THE RIDE HEIGHT SENSOR CIRCUITS FOR AN OPEN

- Measure the resistance between VDM C2131b, harness side and air suspension height sensor C4043, harness side as indicated in the following chart:

VDM	Circuit	Ride Height Sensor
C2131b-4	417 (VT/OG)	C4043-3
C2131b-1	427 (PK/BK)	C4043-2
C2131b-5	432 (BK/PK)	C4043-1



N0105605

- Are the resistances less than 5 ohms?

#### D5 CHECK THE RIDE HEIGHT SENSOR CIRCUITS FOR A SHORT TOGETHER

- Measure the resistance between the ride height sensor circuits, harness side, as indicated in the following chart:

Ride Height Sensor	Circuit	Ride Height Sensor
C4043-2	427 (PK/BK)/ 417 (VT/OG)	C4043-3
C4043-3	417 (VT/OG)/	C4043-1

**Yes**  
GO to D5 .

**No**  
REPAIR the affected circuit(s). REPEAT the self-test.

**Yes**  
GO to D6 .

**No**  
REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.

C4043-2	432 (BK/PK)  427 (PK/BK)/  432 (BK/PK)	C4043-1
<div> <p>N0105259</p> </div> <p><b>• Are the resistances greater than 10,000 ohms?</b></p>		
<b>D6 CHECK THE HEIGHT SENSOR OUTPUT VOLTAGE</b>		
<ul style="list-style-type: none"> <li>• Connect: VDM C2131b.</li> <li>• Connect a fused jumper wire between C4043-3, circuit 417 (VT/OG), harness side and pin 3, circuit 417 (VT/OG), component side.</li> <li>• Connect a fused jumper wire between C4043-1, circuit 432 (BK/PK), harness side and pin 1, circuit 432 (BK/PK), component side.</li> <li>• Ignition ON.</li> <li>• Measure the voltage C4043-2, circuit 427 (PK/BK), harness side and ground, while slowly moving the air suspension height sensor through its full range of motion.</li> </ul> <div> <p>N0105251</p> </div> <p><b>• Does the voltage vary from 0.5 volt to 4.5 volts?</b></p>		
<b>D7 VERIFY VDM CONNECTIONS</b>		
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: VDM C2131b and C2131a.</li> <li>• Check VDM connectors C2131a and C2131b for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ spread terminals</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect: VDM C2131b and C2131a.</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>	

- Make sure the connectors seat correctly, then operate the system and verify the concern is still present.
- **Is the concern still present?**

**Pinpoint Test E: DTC C1770**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

**Normal Operation**

When venting of the rear air suspension system is necessary, the Vehicle Dynamics Module (VDM) sends voltage to the vent solenoid along circuit 421 (PK). This voltage engages the solenoid which then vents the system. The solenoid is provided a ground along circuit 57 (BK). The vent solenoid is part of the air suspension compressor assembly and is serviced as such.

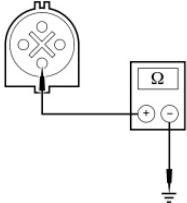
- DTC C1770 (Air Suspension Vent Solenoid Output Circuit Failure) - With the ignition in the RUN position and during a deflate (vent) activity, if the VDM detects an open, a short to voltage or a short to ground on the vent solenoid output circuit, DTC C1770 will be set.

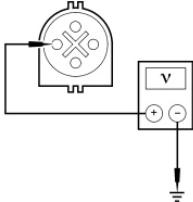
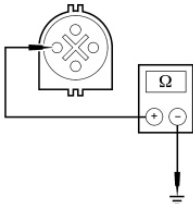
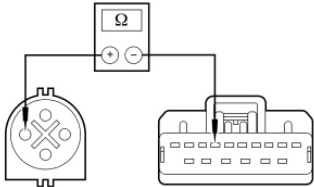
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- VDM
- Air suspension compressor

**PINPOINT TEST E: DTC C1770**

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>E1 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the air compressor C1179-3, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0055962</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 5 ohms?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 57 (BK). CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> GO to <u>E2</u> .</p>
<b>E2 CHECK CIRCUIT 421 (PK) FOR A SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: VDM C2131a.</li> <li>• Disconnect: Air Compressor C1179.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the air compressor C1179-4, circuit 421 (PK), harness side and ground.</li> </ul>  <p>N0059654</p> <p>• Is any voltage present?</p>	<p><b>Yes</b> REPAIR circuit 421 (PK). CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> GO to <u>E3</u> .</p>
<b>E3 CHECK CIRCUIT 421 (PK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the air compressor C1179-4, circuit 421 (PK), harness side and ground.</li> </ul>  <p>N0059653</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> REPAIR circuit 421 (PK). CLEAR the DTC. REPEAT the self-test.</p>
<b>E4 CHECK CIRCUIT 421 (PK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the VDM C2131a-7, circuit 421 (PK), harness side and air compressor C1179-4, circuit 421 (PK), harness side.</li> </ul>  <p>N0068520</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>E5</u> .</p> <p><b>No</b> REPAIR circuit 421 (PK). CLEAR the DTC. REPEAT the self-test.</p>
<b>E5 CHECK THE AIR COMPRESSOR VENT SOLENOID</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the air compressor connector C1179-4, component side, and connector</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in</p>

C1179-3, component side. • <b>Is the resistance between 30 and 35 ohms?</b>	this section. CLEAR the DTCs. REPEAT the self-test.  <b>No</b> INSTALL a new air compressor. REFER to <u>Air Suspension Compressor</u> in this section. CLEAR the DTC. REPEAT the self-test.
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**Pinpoint Test F: DTCs C1790/C1795**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

**Normal Operation**

The Vehicle Dynamics Module (VDM) controls the air spring solenoid by sending a voltage along circuit 1114 (BN/PK) for the LR solenoid and circuit 1115 (TN/WH) for the RR solenoid. This voltage engages the solenoid allowing air to either enter or leave the air spring. Ground for both solenoids is provided along circuit 57 (BK).

- DTC C1790 (LR Air Suspension Air Spring Solenoid Output Circuit Failure) - With the ignition in the RUN position and during a deflate (vent) or inflate (pump) activity, if the VDM detects an open, a short to voltage or a short to ground on the LR air spring solenoid output circuit, DTC C1790 will be set.
- DTC C1795 (RR Air Suspension Air Spring Solenoid Output Circuit Failure) - With the ignition in the RUN position and during a deflate (vent) or inflate (pump) activity, if the VDM detects an open, a short to voltage or a short to ground on the RR air spring solenoid output circuit, DTC C1795 will be set.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Air spring solenoid
- VDM

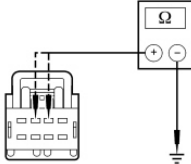
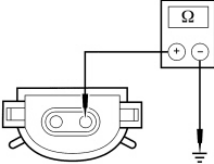
**PINPOINT TEST F: DTCs C1790/C1795**

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>F1 CHECK CIRCUITS 1114 (BN/PK) AND 1115 (TN/WH) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: VDM C2131b.</li> <li>• Disconnect: LR Air Spring Solenoid C4044.</li> <li>• Disconnect: RR Air Spring Solenoid C4045.</li> <li>• Measure the resistance between VDM C2131b-2, circuit 1115 (TN/WH) harness side and RR air spring solenoid C4045-1, harness side.</li> </ul>	<b>Yes</b> GO to <u>F2</u> .  <b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.



<div> </div> <div> <p>N0068522</p> </div> <ul style="list-style-type: none"> <li>• Measure the resistance between VDM C2131b-3, circuit 1114 (BN/PK) harness side and LR air spring solenoid C4044-1, harness side.</li> </ul>	
<div> </div> <div> <p>N0068521</p> </div> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>F2 CHECK CIRCUITS 1114 (BN/PK) AND 1115 (TN/WH) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and: <ul style="list-style-type: none"> <li>♦ VDM C2131b-3, circuit 1114 (BN/PK), harness side.</li> <li>♦ VDM C2131b-2, circuit 1115 (TN/WH), harness side.</li> </ul> </li> </ul> <div> </div> <div> <p>N0068523</p> </div> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <b>F3</b>.</p>
<b>F3 CHECK CIRCUITS 1114 (BN/PK) AND 1115 (TN/WH) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and: <ul style="list-style-type: none"> <li>♦ VDM C2131b-3, circuit 1114 (BN/PK), harness side.</li> <li>♦ VDM C2131b-2, circuit 1115 (TN/WH), harness side.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <b>F4</b>.</p> <p><b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.</p>

 <p>N0068524</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	
<b>F4 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and: <ul style="list-style-type: none"> <li>◆ LR air spring solenoid C4044-2, circuit 57 (BK), harness side.</li> <li>◆ RR air spring solenoid C4045-2, circuit 57 (BK), harness side.</li> </ul> </li> </ul>  <p>N0068525</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>F5</b> .</p> <p><b>No</b> REPAIR circuit 57 (BK). CLEAR the DTCs. REPEAT the self-test.</p>
<b>F5 CHECK THE LR AND RR AIR SPRING SOLENOIDS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between: <ul style="list-style-type: none"> <li>◆ LR air spring solenoid C4044-1, component side, and C4044-2, component side.</li> <li>◆ RR air spring solenoid C4045-1, component side, and C4045-2, component side.</li> </ul> </li> <li>• Are the resistances between 10 and 17 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> INSTALL a new LR or RR air spring solenoid. REFER to <u>Air Spring Solenoid Valve</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p>

**Pinpoint Test G: DTC C1830**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

**Normal Operation**

The Vehicle Dynamics Module (VDM) engages the air suspension relay by providing voltage to the relay along circuit 420 (DB/YE), ground for the relay is provided along 57 (BK). Once the relay is engaged, fused battery voltage is supplied from Battery Junction Box (BJB) fuse 112 (30A) to the relay along circuit 1053 (LB/PK), the voltage travels through the relay and to the air suspension compressor along circuit 538 (GY/RD). The compressor is provided a ground path along circuit 57 (BK).

- DTC C1830 (Air Compressor Relay Circuit Failure) - With the ignition in the RUN position and

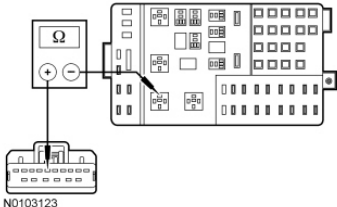
during a deflate (vent) or inflate (pump) activity, if the VDM detects an open, a short to voltage or a short to ground on the air compressor relay circuit 420 (DB/YE), DTC C1830 will be set.

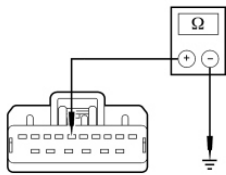
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Air compressor relay
- VDM

#### PINPOINT TEST G: DTC C1830

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>G1 ISOLATE THE AIR COMPRESSOR RELAY</b>	
<ul style="list-style-type: none"> <li>• Carry out the mini-ISO relay component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• Inspect the relay and socket for corrosion, pushed-out pins and spread terminals.</li> <li>• <b>Does the air compressor relay pass the test and are the relay and socket OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>G2</u> .</p> <p><b>No</b> REPAIR or INSTALL a new air compressor relay as necessary. CLEAR the DTC. REPEAT the self-test.</p>
<b>G2 CHECK CIRCUIT 420 (DB/YE) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: VDM C2131a.</li> <li>• Measure the voltage between VDM C2131a-6, circuit 420 (DB/YE), harness side and ground.</li> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 420 (DB/YE). CLEAR the DTC. REPEAT the self-test.</p> <p><b>No</b> GO to <u>G3</u> .</p>
<b>G3 CHECK CIRCUIT 420 (DB/YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between VDM C2131a-6, circuit 420 (DB/YE), harness side and air suspension relay cavity 86, circuit 420 (DB/YE) harness side.</li> </ul>  <p><b>Is the resistance less than 5 ohms?</b></p>	<p><b>Yes</b> GO to <u>G4</u> .</p> <p><b>No</b> REPAIR circuit 420 (DB/YE). CLEAR the DTC. REPEAT the self-test.</p>
<b>G4 CHECK CIRCUIT 420 (DB/YE) FOR A SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between VDM C2131a-6, circuit 420 (DB/YE), harness side and ground.</li> </ul>  <p>N0068528</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. REPEAT the self-test.</p> <p><b>No</b> REPAIR circuit 420 (DB/YE). CLEAR the DTC. REPEAT the self-test.</p>
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### Pinpoint Test H: DTC C1840 - The Scan Tool Indicates Self-Test Failure When Attempting to Carry Out the Self-Test

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

#### Normal Operation

In the ON position, a signal is sent from the Vehicle Dynamics Module (VDM) along circuit 417 (VT/OG) to circuit 635 (YE) through the closed air suspension switch. The VDM receives this signal and activates the air suspension system. In the OFF position, this signal is interrupted by the open air suspension switch and the VDM deactivates the air suspension system.

- DTC C1840 (Air Suspension Disable Switch Circuit Failure) - If during the VDM on-demand self test, the air suspension switch is not in the ON position or the VDM detects an open, a short to voltage or a short to ground on the air suspension switch circuit, DTC C1840 will set.

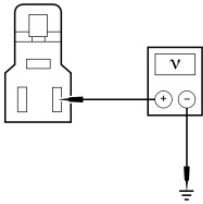
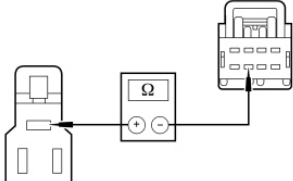
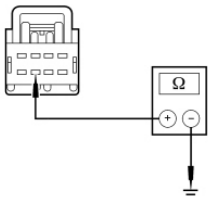
#### This pinpoint test is intended to diagnose the following:

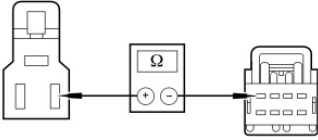
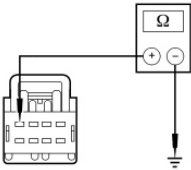
- Wiring, terminals or connectors
- Air suspension switch
- VDM

### PINPOINT TEST H: DTC C1840 - THE SCAN TOOL INDICATES SELF-TEST FAILURE WHEN ATTEMPTING TO CARRY OUT THE SELF-TEST

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>H1 CHECK THE AIR SUSPENSION SWITCH VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Air Suspension Switch C4087.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between air suspension switch C4087-2, circuit 417 (VT/OG), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> GO to <u>H4</u> .</p>

 <p>N0068529</p> <p>• Is the voltage approximately 5 volts?</p>	
<b>H2 CHECK CIRCUIT 635 (YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: VDM C2131a.</li> <li>• Disconnect: VDM C2131b.</li> <li>• Measure the resistance between air suspension switch C4087-1, circuit 635 (YE), harness side and VDM C2131b-7, circuit 635 (YE), harness side.</li> </ul>  <p>N0068530</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>H3</u> .</p> <p><b>No</b> REPAIR circuit 635 (YE). CLEAR the DTCs. REPEAT the self-test.</p>
<b>H3 CHECK CIRCUIT 635 (YE) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between VDM C2131b-7, circuit 635 (YE), harness side and ground.</li> </ul>  <p>N0068531</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>H6</u> .</p> <p><b>No</b> REPAIR circuit 635 (YE). CLEAR the DTCs. REPEAT the self-test.</p>
<b>H4 CHECK CIRCUIT 417 (VT/OG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between air suspension switch C4087-2, circuit 417 (VT/OG), harness side and VDM C2131b-4, circuit 417 (VT/OG).</li> </ul>	<p><b>Yes</b> GO to <u>H5</u> .</p> <p><b>No</b> REPAIR circuit 417 (VT/OG). CLEAR the DTCs. REPEAT the self-test.</p>

 <p>N0068532</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>H5 CHECK CIRCUIT 417 (VT/OG) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between VDM C2131b-4, circuit 417 (VT/OG), harness side and ground.</li> </ul>  <p>N0068533</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>H6</b> .</p> <p><b>No</b> REPAIR circuit 417 (VT/YE). CLEAR the DTCs. REPEAT the self-test.</p>
<b>H6 CHECK THE AIR SUSPENSION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Push the air suspension switch to the ON position.</li> <li>• Measure the resistance between air suspension switch pin 1, component side and pin 2, component side.</li> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>H7</b> .</p> <p><b>No</b> INSTALL a new air suspension switch. REFER to <u>Air Suspension Switch</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p>
<b>H7 VERIFY VDM CONNECTIONS</b>	
<ul style="list-style-type: none"> <li>• Check VDM connectors C2131a and C2131b for damage or loose connections.</li> <li>• Are the module connections OK?</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section.</p> <p><b>No</b> REPAIR the VDM connectors. CLEAR the DTCs. REPEAT the self-test.</p>

### Pinpoint Test I: The Air Compressor is Inoperative

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.

#### Normal Operation

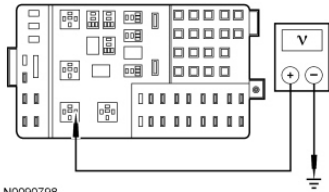
When the Vehicle Dynamics Module (VDM) engages the air suspension relay, fused battery voltage is supplied from Battery Junction Box (BJB) fuse 112 (30A) to the relay along circuit 1053 (LB/PK), the voltage travels through the relay and to the air suspension compressor along circuit 538 (GY/RD). The compressor is provided a ground path along circuit 57 (BK).

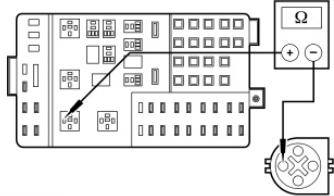
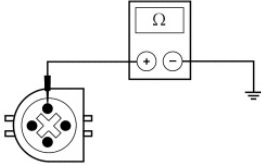
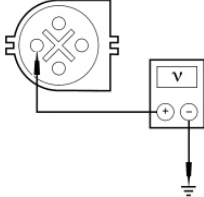
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Air compressor relay
- Air compressor assembly
- VDM

#### PINPOINT TEST I: THE AIR COMPRESSOR IS INOPERATIVE

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>I1 CHECK THE AIR COMPRESSOR RELAY</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Air Suspension Relay.</li> <li>• Carry out the relay component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Does the relay pass the component test?</b></li> </ul>	<p><b>Yes</b> GO to <u>I2</u> .</p> <p><b>No</b> INSTALL a new air suspension relay. REPEAT the self-test.</p>
<b>I2 CHECK CIRCUIT 1053 (LB/PK) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Air Suspension Relay .</li> <li>• Measure the voltage between air suspension relay cavity 30, circuit 1053 (LB/PK), harness side and ground.</li> </ul>  <p>N0090798</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>I3</u> .</p> <p><b>No</b> VERIFY BJB fuse 112 (30A) is OK. If OK, REPAIR circuit 1053 (LB/PK). If not OK, REFER to the Wiring Diagrams Manual to identify the possible cause of the circuit short. REPEAT the self-test.</p>
<b>I3 CHECK CIRCUIT 538 (PK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Air Compressor C1179.</li> <li>• Measure the resistance between air suspension relay cavity 87, circuit 538 (GY/RD), harness side and air compressor C1179-2, circuit 538 (GY/RD), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> REPAIR circuit 538 (GY/RD). REPEAT the self-test.</p>

 <p>N0090797</p> <p>• Is the resistance less than 5 ohms?</p>	
<b>I4 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between air compressor C1179-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>GF1407-A</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>I5</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK). REPEAT the self-test.</p>
<b>I5 CHECK CIRCUIT 538 (GY/RD) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Connect: Air Suspension Relay.</li> <li>• Ignition ON.</li> <li>• Trigger the air compressor ON active command.</li> <li>• Measure the voltage between air compressor C1179-2, circuit 538 (GY/RD), harness side and ground.</li> </ul>  <p>N0068534</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> INSTALL a new air compressor. REFER to <u>Air Suspension Compressor</u> in this section. REPEAT the self-test.</p> <p><b>No</b> REPAIR circuit 538 (GY/RD). REPEAT the self-test.</p>

**Pinpoint Test J: The Air Compressor Continuously Cycles with the Ignition Switch in the OFF Position and No DTCs Are Set**

Refer to Wiring Diagrams Cell 41 , Vehicle Dynamic Suspension for schematic and connector information.



**Normal Operation**

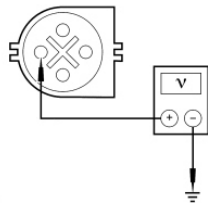
When the Vehicle Dynamics Module (VDM) engages the air suspension relay, fused battery voltage is supplied to the air suspension compressor along circuit 538 (GY/RD). The compressor is provided a ground path along circuit 57 (BK).

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Air compressor relay
- Air compressor assembly
- VDM

**PINPOINT TEST J: THE AIR COMPRESSOR CONTINUOUSLY CYCLES WITH THE IGNITION SWITCH IN THE OFF POSITION AND NO DTCS ARE SET**

Test Step	Result / Action to Take
<b>J1 CHECK FOR MODULE ACTIVITY</b>	
<p><b>NOTE:</b> The VDM is powered for approximately 60 minutes after the ignition switch is placed in the OFF position. During this time, the air suspension will correct for vehicle weight by raising the vehicle.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Turn the air suspension switch to the OFF position.</li> <li>• Verify the air compressor still cycles 60 minutes after the ignition switch is placed in the OFF position.</li> <li>• <b>Does the air compressor still cycle continuously after the VDM is disabled?</b></li> </ul>	<p><b>Yes</b> GO to <u>J2</u> .</p> <p><b>No</b> The system is OK.</p>
<b>J2 CHECK THE VDM</b>	
<ul style="list-style-type: none"> <li>• Disconnect: VDM C2131a.</li> <li>• <b>Does the air compressor still cycle?</b></li> </ul>	<p><b>Yes</b> GO to <u>J3</u> .</p> <p><b>No</b> INSTALL a new VDM . REFER to <u>Vehicle Dynamics Module (VDM)</u> in this section. TEST the system for normal operation.</p>
<b>J3 CHECK THE AIR SUSPENSION RELAY FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Air Suspension Relay.</li> <li>• <b>Does the air compressor still cycle?</b></li> </ul>	<p><b>Yes</b> GO to <u>J4</u> .</p> <p><b>No</b> INSTALL a new air suspension relay. TEST the system for normal operation.</p>
<b>J4 CHECK CIRCUIT 538 (GY/RD) FOR A SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Air Compressor C1179.</li> <li>• Measure the voltage between air compressor C1179-2, circuit 538 (GY/RD), harness side and ground.</li> </ul>  <p>N0068534</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 538 (GY/RD). REPEAT the self-test.</p> <p><b>No</b> INSTALL a new air suspension compressor. REFER to <u>Air Suspension Compressor</u> in this section. TEST the system for normal operation.</p>
--	--

## Component Test

### Air Suspension Relay

Refer to Wiring Diagrams Cell 149 for component testing.

### Pneumatic Test

This test verifies that the air lines are connected and that they are not restricted. It also verifies that the air compressor, air compressor vent solenoid and air spring solenoid valves are functioning correctly. Verify that the following conditions are met before running the Pneumatic Test.

- All doors, the liftgate and the liftgate glass must be closed.
- Transmission must be in PARK.
- The ignition switch is in the RUN position.
- The air suspension service switch must be in the ON position.
- Battery voltage is greater than 11 volts for the duration of the test.

1. Fulfill the pre-test conditions.
2. Follow the directions on the scan tool to carry out the Pneumatic Test.

### Trim Height Test (or Accurate Trim Test)

**NOTE:** The trim height test is used to verify trim height only. If trim height needs to be adjusted, refer to Ride Height Adjustments in this section.

The trim height test is used to make the vehicle level to within 2 mm (0.08 in) of the calibrated trim height. Accurate trim test should be run before setting vehicle alignment.

- All doors, the liftgate and the liftgate glass must be closed.
- Transmission must be in PARK.
- The ignition switch is in the RUN position.
- The air suspension service switch must be in the ON position.
- Battery voltage is greater than 11 volts for the duration of the test.

1. Fulfill the pre-test conditions.

2. Install a battery charger for the Trim Height Test to prevent battery drain.
  3. Follow the directions on the scan tool to carry out the Trim Height Test.
-

**Ride Height Adjustments**

## Special Tool(s)

 ST2871-A	Gauge, Ride Height "D" Dimension 204-164 (T90P-5995-B)
 ST2834-A	Vehicle Dynamic Module (VDM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

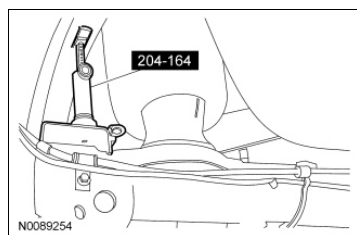
**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** The suspension height D dimensions are for reference only. The vehicle suspension height position must be controlled by the correct dimensions to prevent vehicle damage.

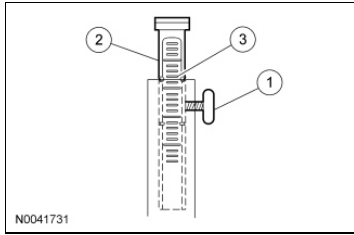
**NOTE:** Improper air suspension ride height D dimension can be caused by an air suspension system that is incorrectly adjusted.

**NOTE:** The ride height D dimension is the distance between the rear axle and the vehicle frame.

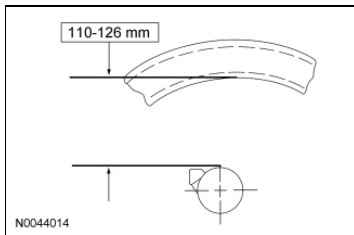
1. Position the vehicle on a level surface over an open repair pit.
2. Open the luggage compartment and verify that the air suspension switch is in the ON position.
3. Turn the ignition switch to the RUN position and wait at least 2 minutes.
4. Position the Ride Height Dimension "D" Gauge on the rear axle.



5. Measure the ride height D dimension.
  1. Release the set screw.
  2. Pull the sliding post and scale up until it touches the bottom of the inboard frame rail and lock the set screw.
  3. Measure the ride height D dimension.



6. If ride height dimension D is not within specification, use the scan tool to vent or fill the air suspension to the correct dimension.

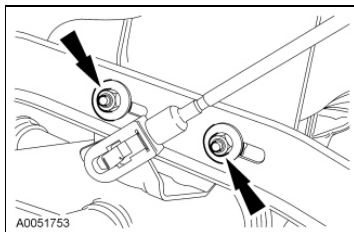


7. **NOTE:** Vehicle Dynamics Module (VDM) is programmed to identify a reading of 2.80 volts as suspension trim height.

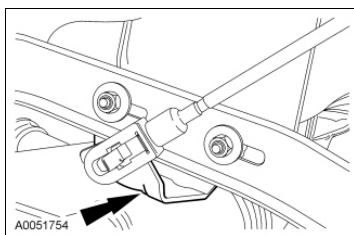
Using the scan tool, monitor the VDM rear height sensor voltage (HGTSNVOLT) PID.

- If the PID displays 2.80 volts, the ride height is OK at this time.
- If the PID displays something other than 2.80 volts, continue to the next step.

8. Loosen the height sensor bracket nuts.



9. Slide the bracket until the HGTSNVOLT PID displays 2.80 volts.



10. Tighten the height sensor bracket inner nuts to 11 Nm (97 lb-in) and the outer nuts to 12 Nm (106 lb-in).



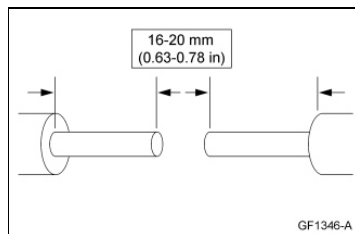
## Air Leaks

1. Apply a soapy water solution to the air tubes, air tube fittings, air springs, upper spring shock mount and the air compressor.
2. **NOTE:** If a leak is detected within the air compressor, install a new compressor. If a leak is detected in a tube, carry out the air tube repair procedure.

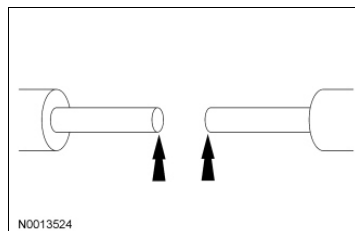
Verify the location of air leak(s) and repair or install new components as necessary.

## Air Tube Repair

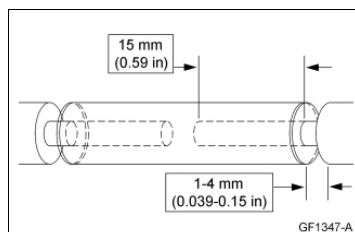
1. Cut the tube at the damaged area.
2. Trim the sleeve material from both ends of the damaged tube.



3. Taper both ends of the tube by shaving or sanding it 3 mm (0.11 in) from the tips.



4. Install the repair filling.



5. **NOTE:** Check system for leaks.

Inflate the air suspension system. For additional information, refer to Ride Height Adjustments in this section.





## Air Line Fluid Purge

**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

1. **NOTE:** Carry out this procedure if fluid (water and/or oil) is found in the air tube. Purge fluid from rear air tubes and install new components if affected.

Disconnect the air tube at the air compressor drier.

2. Disconnect the air tube from the air springs.
3. Connect shop air to the disconnected air tube and blow any fluid out.
4. **NOTE:** When installing the air tubes, make sure the white tube is fully inserted into the fitting for correct installation.


Reconnect the air tubes at the air springs.

5. Install a new air compressor drier. For additional information, refer to Air Suspension Compressor in this section.
  6. Reconnect the air tube to the air compressor drier.
  7. Make sure that all air tube fittings are sealed.
-

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## Air Spring Inflation and Deflation

Special Tool(s)

	Vehicle Dynamics Module (VDM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** Failure to observe the following instructions may result in a sudden failure of the air spring or suspension system.

- Any rear spring which is unfolded must be refolded prior to being installed in a vehicle.
- The air spring refolding procedure should only be used for an air spring which has never supported the vehicle's weight while in the incorrectly folded position.
- Incorrectly folded air springs found on vehicles during pre-delivery inspection or after use must be replaced.
- Do not attempt to inflate any air spring which has been collapsed while uninflated from the rebound hanging position to the jounce stop.
- When installing a new air spring, care must be taken not to apply a load to the suspension until the springs have been inflated using the air spring fill procedure.
- After inflating an air spring in the hanging position, it must be inspected for correct shape.

**NOTICE:** Prior to installing an air spring, make sure the air spring is in the correct shape with no folds or creases. If the air spring is not in the correct shape, carry out air spring refold before installing the air spring, to prevent air spring damage.

1. Turn the ignition switch to the RUN position.
2. Connect the scan tool to the Data Link Connector (DLC).
3. Toggle the Vehicle Dynamics Module (VDM) active command LR\_SOL (LR) or RR\_SOL (RR) from OFF to ON.
4. **NOTE:** When using the VDM active command AS\_COMP, do not run the air compressor for more than 3 minutes to prevent overheating and shutdown. If this occurs, wait for the system to cool down before resuming the inflation procedure.

Toggle the VDM active command AS\_VENT ON to deflate the air springs or AS\_COMP ON to inflate the air springs.

---



## Air Spring Refold

**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

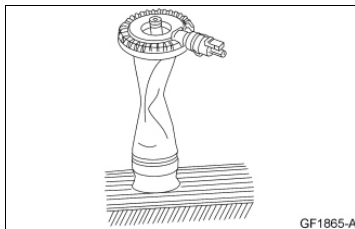
**NOTICE:** Failure to observe the following instructions may result in a sudden failure of the air spring or suspension system.

- Any rear spring which is unfolded must be refolded prior to being installed in a vehicle.
- The air spring refolding procedure should only be used for an air spring which has never supported the vehicle's weight while in the incorrectly folded position.
- Incorrectly folded air springs found on vehicles during pre-delivery inspection or after use must be replaced.
- Do not attempt to inflate any air spring which has been collapsed while uninflated from the rebound hanging position to the jounce stop.
- When installing a new air spring, care must be taken not to apply a load to the suspension until the springs have been inflated using the air spring fill procedure.
- After inflating an air spring in the hanging position, it must be inspected for correct shape.

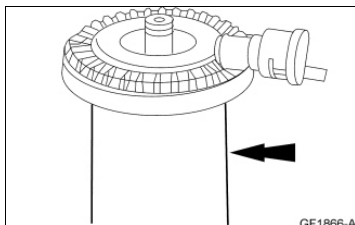
**NOTICE:** Prior to installing an air spring, make sure the air spring is in the correct shape with no folds or creases. If the air spring is not in the correct shape, carry out air spring refold before installing the air spring, to prevent air spring damage.

1. **NOTICE:** Do not clamp any portion of air spring piston or damage to the air spring may occur.

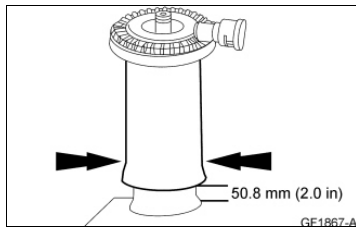
Place the air spring on a flat surface.



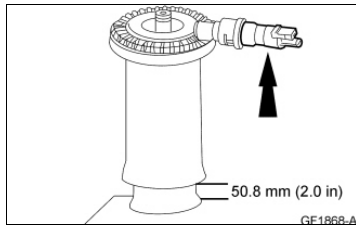
2. Remove the air spring solenoid to expand the collapsed air bag.

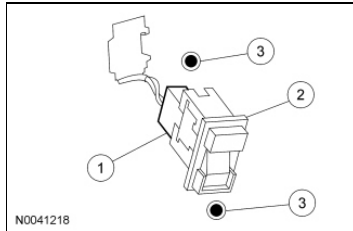


3. Push the membrane down over the piston to the correct height.



4. Install the air spring solenoid to help maintain the correct height.



**Air Suspension Switch**

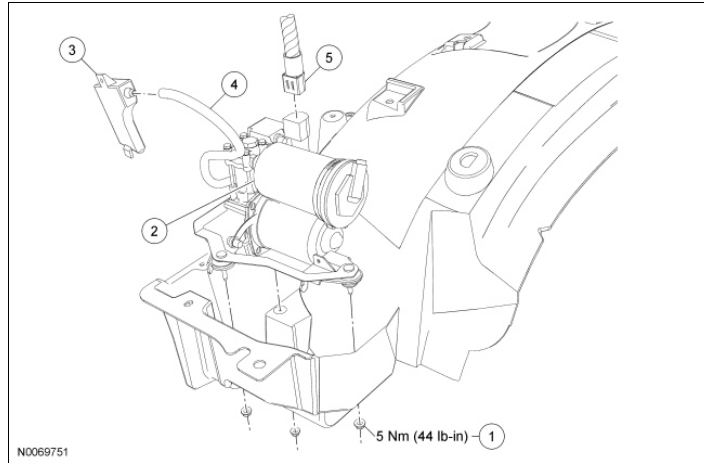
Item	Part Number	Description
1	-	Air suspension switch electrical connector (part of 14A005)
2	5K761	Air suspension switch
3	-	Pushpin retainers

**Removal and Installation**

**⚠ WARNING:** Any air spring which is unfolded must be refolded prior to being installed in a vehicle. Refer to the procedure in this section. An incorrectly folded air spring could rupture, altering the handling characteristics of the vehicle. If a vehicle has been driven with an incorrectly folded air spring, a new air spring must be installed. Failure to follow these instructions may result in serious injury to vehicle occupant(s).

1. Turn the air suspension service switch to the OFF position.
2. Peel back the luggage compartment trim in the following sequence.
  1. Remove the pushpins.
  2. Peel back the luggage compartment trim.
3. Remove the air suspension switch in the following sequence.
  1. From behind the quarter panel reinforcement, depress the clips.
  2. Remove the air suspension switch.
4. Disconnect the air suspension switch electrical connector.
5. To install, reverse the removal procedure.



**Air Suspension Compressor**

Item	Part Number	Description
1	N803300	Air suspension compressor bracket nut (3 required)
2	5319	Air suspension compressor assembly
3	5C195	Air suspension compressor canister
4	5A897	Air hose
5	14A435	Air suspension compressor electrical connector (part of wiring harness 14A435)

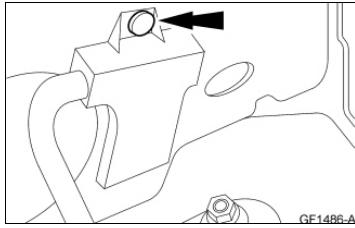
**Removal and Installation**

1. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

Turn the air suspension service switch to the OFF position.

2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
3. Remove the air cleaner. For additional information, refer to [Section 303-12](#).
4. Remove the air compressor drier cover in the following sequence.
  1. Remove the pushpins.
  2. Remove the air compressor drier cover.
5. Remove the canister pushpin and remove the canister.





6. Disconnect the air suspension compressor in the following sequence.
  1. Compress the quick connect locking ring and pull out the air tube.
  2. Disconnect the air suspension compressor electrical connector.
7. Remove the 3 air suspension compressor bracket nuts.
  - To install, tighten to 5 Nm (44 lb-in).
8. Remove the air suspension compressor assembly.
9. **NOTE:** To correctly reinstall the air tubes into the compressor drier, a minimum of 3 mm (1/8 in) of visible white tube must be inserted into the fitting.

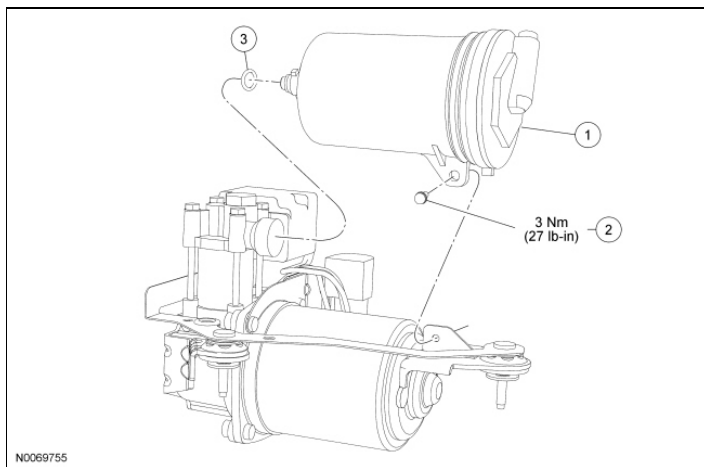
To install, reverse the removal procedure.

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**Air Suspension Compressor Drier**

## Material

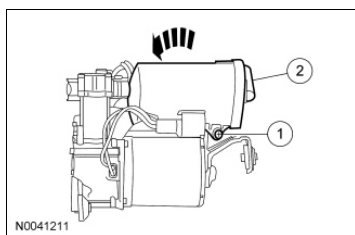
Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A



Item	Part Number	Description
1	5345	Air suspension compressor drier
2	-	Air suspension compressor drier screw (part of 5345)
3	-	O-ring (part of 5345)

**Removal and Installation**

1. Remove the air suspension compressor. For additional information, refer to [Air Suspension Compressor](#) in this section.
2. Remove the air suspension compressor drier.
  1. Remove the screw.
    - ◆ To install, tighten to 3 Nm (27 lb-in).
  2. Rotate the air compressor drier 90 degrees to unlock, then remove the air suspension compressor drier.

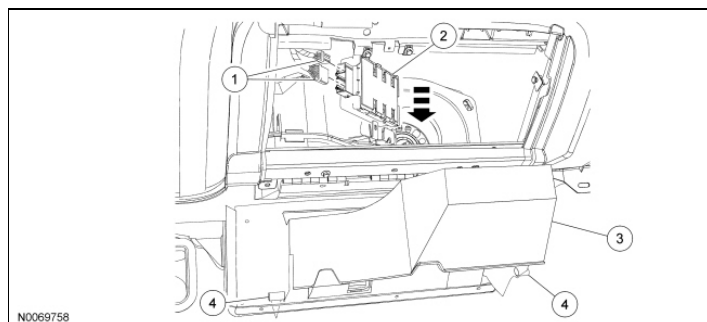


3. **NOTE:** Inspect the O-ring for damage and install a new O-ring as necessary. Lubricate the solenoid seal area with grease.

**NOTE:** When installing the air tubes, make sure the white tube is fully inserted into the fitting for correct installation.

To install, reverse the removal procedure.

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**Vehicle Dynamics Module (VDM)**

Item	Part Number	Description
1	-	Vehicle Dynamics Module (VDM) electrical connectors (part of 14489) (2 required)
2	3C142	VDM
3	06024	Glove compartment door
4	-	Glove compartment door tabs (part of 06024) (2 required)

**Removal and Installation**

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

1. **NOTE:** This step is necessary only if a new VDM module is being installed.


Connect the scan tool and upload the module configuration information from the Vehicle Dynamics Module (VDM). For additional information, refer to [Section 418-01](#).

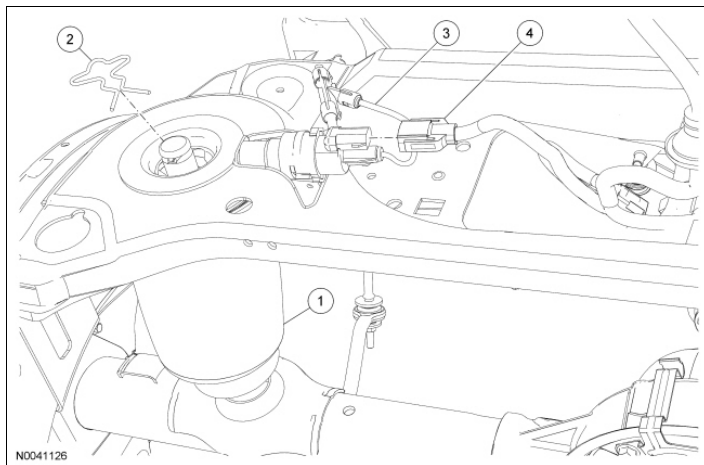
2. Turn the air suspension service switch to the OFF position.
3. While pushing in on the 2 glove compartment door tabs, position the glove compartment downward.
4. Remove the VDM in the following sequence.
  1. Disconnect the 2 electrical connectors.
  2. Disconnect the module from the bracket.
  3. Remove the VDM.
5. To install, reverse the removal procedure.
  - When installing a new VDM, it must be configured (using vehicle as-built data or module configuration information retrieved earlier in this procedure). For additional information on configuration, refer to Programmable Module Installation (PMI) in [Section 418-01](#).



**Air Spring**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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Item	Part Number	Description
1	5A9665560	Air spring
2	5A966	Air spring retainer
3	5A897	Air tube
4	14A435	Air spring solenoid electrical connector (part of wiring harness 14A435)

**Removal**

**⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Any air spring which is unfolded must be refolded prior to being installed in a vehicle. Refer to the procedure in this section. An incorrectly folded air spring could rupture, altering the handling characteristics of the vehicle. If a vehicle has been driven with an incorrectly folded air spring, a new air spring must be installed. Failure to follow these instructions may result in serious injury to vehicle occupant(s).

**NOTICE:** Failure to observe the following instructions may result in a sudden failure of the air spring or suspension system.

- Any rear spring which is unfolded must be refolded prior to being installed in a vehicle.
- The air spring refolding procedure should only be used for an air spring which has never supported

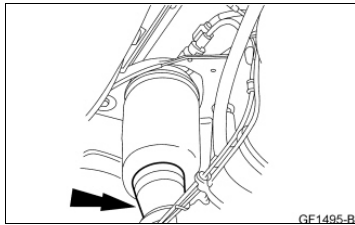
the vehicle's weight while in the incorrectly folded position.

- Incorrectly folded air springs found on vehicles during pre-delivery inspection or after use must be installed new.
- Do not attempt to inflate any air spring which has been collapsed while uninflated from the rebound hanging position to the jounce stop.
- When installing a new air spring, care must be taken not to apply a load to the suspension until springs have been inflated using the air spring fill procedure.
- After inflating an air spring in the hanging position, it must be inspected for correct shape.

1. **NOTE:** The vehicle must be positioned on a suitable lifting device prior to deflating the air suspension system.

With the vehicle in NEUTRAL, position on a hoist until the wheel and tire assemblies are slightly above the ground. For additional information, refer to Section 100-02A .

2. Using the scan tool, vent the air springs.
3. Remove the air spring retainer.
4. Detach the air spring from the rear axle.

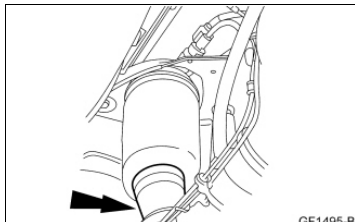


5. Remove the air spring in the following sequence.
  1. Disconnect the air spring solenoid electrical connector.
  2. Compress the quick connect locking ring and pull out the air tube.
  3. Remove the air spring.

## Installation

1. Install the air spring in the following sequence.
  1. Position the air spring assembly in the frame seat.
  2. Install the spring retainer clip.

2. Seat the bottom of the air spring on the rear axle.



3. **NOTE:** When installing the air tubes, make sure the white tube is fully inserted into the fitting for correct installation.

Connect the air spring solenoid valve in the following sequence.


1. Connect the air spring solenoid electrical connector.

2. Connect the air tube.
  3. Make sure the air spring is in the correct shape.
  4. **NOTICE:** To avoid damage to the air spring, do not allow the suspension to compress before the spring is inflated.
- Lower the vehicle until the wheel and tire assemblies are slightly above the ground.
5. Using the scan tool, inflate the air springs.
-



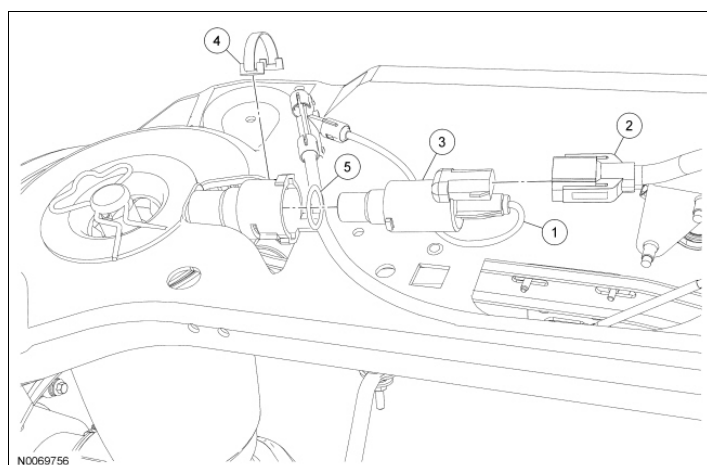
**Air Spring Solenoid Valve**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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## Material

Item	Specification
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A



Item	Part Number	Description
1	5A897	Air tube
2	14A435	Electrical connector (part of wiring harness 14A435)
3	5A891	Air spring solenoid valve
4	5308	Air spring solenoid valve retainer
5	-	O-ring (part of 5A891)

**Removal and Installation**

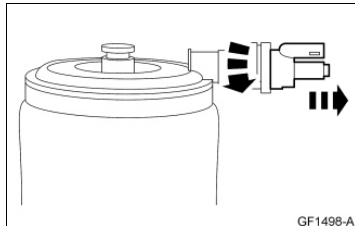
1. If the air spring solenoid valve is functional, use the scan tool to vent the appropriate air spring(s). For additional information, refer to Air Spring Inflation and Deflation in this section.
2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A.
3. Disconnect the electrical connector and the air tube in the following sequence.
  1. Disconnect the electrical connector.
  2. Compress the quick connect lock ring and pull out on the air tube.

4. **NOTICE:** Remove any dirt or other foreign material from the air spring assembly prior to removing the air spring solenoid valve from the air spring assembly or damage to the air spring solenoid may occur.

Remove the air spring solenoid retainer.

5. **⚠ WARNING:** Vent all air pressure from the air suspension system prior to disconnecting or removing any air suspension components. It is dangerous to remove air suspension components while under pressure. Failure to follow this instruction may result in serious personal injury.

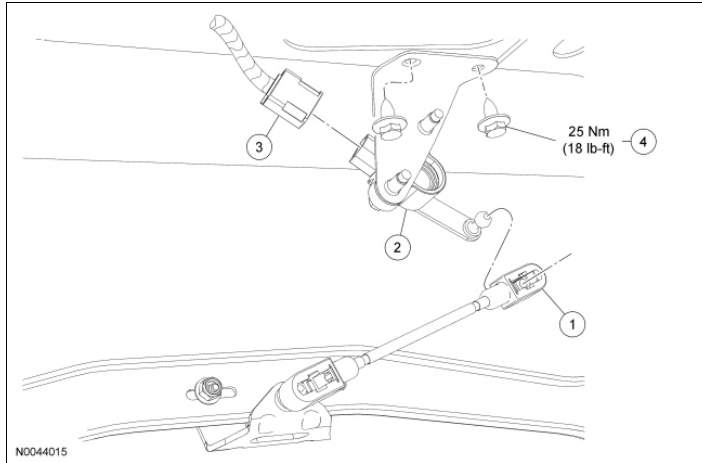
Rotate the air spring solenoid and remove the solenoid.



6. **NOTE:** Inspect the O-ring for damage and install a new O-ring as necessary. Lubricate the solenoid seal area with silicone grease.

**NOTE:** When installing the air tubes, make sure the white tube is fully inserted into the fitting for correct installation.

To install, reverse the removal procedure.

**Suspension Height Sensor**

Item	Part Number	Description
1	5359	Height sensor connecting link
2	5A955	Suspension height sensor
3	12614	Height sensor electrical connector (part of wiring harness 12614)
4	N605890	Height sensor bracket bolt (2 required)

**Removal and Installation**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
2. Disconnect the suspension height sensor electrical connector.
3. Disconnect the suspension height sensor connecting link.
4. Remove the 2 height sensor bracket bolts and the height sensor.
  - To install, tighten to 25 Nm (18 lb-ft).
5. To install, reverse the removal procedure.
6. Adjust the height sensor. For additional information, refer to [Ride Height Adjustments](#) in this section.



## Material

Item	Specification	Fill Capacity
Additive Friction Modifier XL-3 (US); CXL-3 (Canada)	EST-M2C118-A	118 ml (4 oz)
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5	2.2L (4.75 pt)
Motorcraft® SAE 80W-90 Premium Rear Axle Lubricant XY-80W90-QL (US); CXY-80W90-1L (Canada)	WSP-M2C197-A	2.2L (4.75 pt)
Threadlock and Sealer TA-25	WSK-M2G351-A5	-

## General Specifications

Item	Specification
Maximum driveshaft runout	0.89 mm (0.035 in)
Maximum flange runout	0.25 mm (0.010 in)
Minimum rotational torque (Traction-Lok)	27 Nm (20 lb-ft)



## Driveline System

The driveline system consists of the:


- driveshaft tube, slip yoke, U-joints and flange.
- rear axle assembly with flange, pinion, ring gear, differential and axle shafts.

The source of the drivetrain power is generated by the engine and delivered to the transmission. The driveline transfers the engine torque through the driveshaft to the axle. The driveshaft is connected to the output shaft of the transmission and to the axle. The engine torque enters the axle through the drive pinion, which rotates the ring gear. The ring gear is mounted to the differential case, which contains the gears that transmit power to the axle shafts. These shafts rotate the drive wheels.

## Axle Identification

The axle ratio may be verified by checking the printed label on the axle housing. If worn or not visible, the Vehicle Identification Number (VIN) can be typed in the service parts ordering system, or the Vehicle Certification (VC) label may be used to correctly identify the axle and ratio. The VC label is located in the driver door jamb. The first 2 digits of the axle code indicate the gear ratio and type of the rear axle. For information on the VC label, refer to [Section 100-01](#).

### Vehicle Certification (VC) Label Example

MFD. BY FORD MOTOR CO. IN U.S.A.									
DATE: XXXXX		GVWR: XXXXXXXXXXXXXXXX							
FRONT GAWR: XXXXXX		XXXXXX							
REAR GAWR: XXXXXX		XXXXXX							
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.									
VIN: XXXXXXXXXXXXXXXX		XXXXXX							
TYPE: XXXXXXXXXXXXXXXX		XXXXXX							
									
EXT PNT: XXXXXX XXXXXX		RC: XX		DSO: XXXX					
BRK	INT	TR	TP/PS	R	AXLE	TR	SPR		
X	XX	XXX	X	XX	X	XXXX			

↑

DY0190-B









SECTION 205-00: Driveline System - General  
Information  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 01/28/2011

## Driveline System

### Special Tool(s)

 ST1268-A	Clamp Plate, Driveshaft 205-320 (T92L-4851-C)
 ST1266-A	Dial Indicator Gauge with Holding Fixture 100-D002 (D78P-4201-B) or equivalent
 ST2040-A	Gauge, Differential Clutch 205-022 (T66L-4204-A)
 ST1267-A	Runout Gauge, Drive Pinion Flange 205-319 (T92L-4851-B)

### Material

Item	Specification
Additive Friction Modifier XL-3 (US); CXL-3 (Canada)	EST-M2C118-A
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5
Motorcraft® SAE 80W-90 Premium Rear Axle Lubricant XY-80W90-QL (US); CXY-80W90-1L (Canada)	WSP-M2C197-A
Threadlock and Sealer TA-25	WSK-M2G351-A5

## Principals of Operation

### Driveline System - General Information

The driveline system enables the power generated by the engine and transferred through the transmission to place the vehicle in motion. Rotational torque is received from the transmission to the rear axle by way of the driveshaft. A slip joint on the forward end of the driveshaft connects the driveshaft to the transmission output shaft. This slip joint allows the change in length variation of the driveshaft during the normal vehicle drive cycle. The U-joints at the end of the shafts allow the shafts to rotate smoothly in an allowable angle plane. The rotational torque is introduced into the axle drive pinion which drives the differential ring gear. The ring gear is bolted to the axle differential which divides the torque between the left and right axle shafts, while permitting the shafts to turn at different speeds when required, such as when cornering.

## Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 419-03 for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• U-joints</li> <li>• Driveshaft tubes</li> <li>• Mounting brackets</li> <li>• Flanges</li> <li>• Housing and cover damage</li> <li>• Differential bearings</li> <li>• Differential gearsets</li> <li>• Pinion bearings</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and GO to Symptom Chart - Driveline System or GO to Symptom Chart - NVH .

Certain axle and driveline symptoms are also common to the engine, transmission, wheel bearings, tires and other parts of the vehicle. For this reason, be sure that the cause of the trouble is in the driveline before disassembling, adjusting or repairing the driveline. Refer to Section 100-04 .

### Symptom Chart - Driveline System

Symptom Chart - Driveline System

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

**ConditionPossible SourcesAction**

- Axle howling or whine
- Axle lubricant low
- CHECK the lubricant level. FILL the axle to specification.
- Axle housing damage
- INSPECT the axle housing for damage. REPAIR or INSTALL a new axle as necessary. REFER to Section 205-02 .
- Damaged or worn axle shaft bearings
- CHECK for abnormal axle shaft bearing play or roughness. REFER to Section 205-02 .
- Damaged or worn differential ring and pinion
- INSPECT and INSTALL a new differential ring and pinion as necessary. REFER to Section 205-02 .
- Damaged or worn differential side or pinion bearings
- INSPECT and INSTALL new differential side or pinion bearings as necessary. REFER to Section 205-02 .
- Driveline clunk - loud clunk when shifting from reverse to drive
- Incorrect axle lubricant level
- CHECK the lubricant level. FILL the axle to specification.
- Excessive backlash in the axle
- CHECK the axle backlash. REPAIR as necessary. REFER to Section 205-02 .
- Damaged or worn pinion bearings
- REPAIR or INSTALL new pinion bearings as necessary. REFER to Section 205-02 .
- Damaged or worn U-joints
- INSPECT the U-joints for wear or damage. INSTALL new U-joints or driveshaft as necessary. REFER to Section 205-01 .
- Driveline clunk - occurs as the vehicle starts to move forward following a stop
- Worn driveshaft U-joints with excessive play
- INSPECT the U-joints for a worn condition. INSTALL a new driveshaft or U-joints as necessary. REFER to Section 205-01 .
- Loose rear axle mount

- CHECK the axle for loose bolts. TIGHTEN to specification. REFER to Section 205-02 .
- High pitched chattering - noise from the axle when the vehicle is turning
- Incorrect or contaminated lubricant
- CHECK the vehicle by driving in tight circles (5 clockwise, 5 counterclockwise). FLUSH and REFILL with the specified rear axle lubricant and friction modifier as necessary.
- Damaged or worn differential (differential side gears and pinion gears)
- REPAIR or INSTALL new differential side gears or pinion gears as necessary. REFER to Section 205-02 for the rear axle.
- Buzz - buzzing noise is the same at cruise or coast/deceleration
- Incorrect driveline angles
- CHECK for correct driveline angles. REPAIR as necessary. REFER to Driveline Angle Measurement in this section.
- Rumble or boom - noise occurs at coast/deceleration, usually driveshaft speed-related and noticeable over a wide range of speeds
- Driveshaft is out-of-balance
- CHECK the driveshaft for damage, missing balance weights or undercoating. REFER to Driveshaft Runout and Balancing in this section.
- U-joints are binding or seized
- ROTATE the driveshaft and CHECK for rough operation or seized U-joints. INSTALL new U-joints or driveshaft as necessary. REFER to Section 205-01 .
- Grunting - normally associated with a shudder experienced during acceleration from a complete stop
- Loose rear axle mount bolts or suspension fasteners
- INSPECT the rear suspension and axle. TIGHTEN the fasteners to specification. REFER to Section 205-02 .
- Howl - can occur at various speeds and driving conditions. Affected by acceleration and deceleration
- Incorrect ring and pinion contact, incorrect bearing preload or gear damage
- INSPECT and REPAIR as necessary. REFER to Section 205-02 .
- Chuckle - heard at coast/deceleration. Also described as a knock
- Incorrect ring and pinion contact or damaged teeth on the coast side of the ring and pinion
- INSPECT and REPAIR as necessary. REFER to Section 205-02 .
- Knock - noise occurs at various speeds. Not affected by acceleration or deceleration

- Gear tooth damage to the drive side of the ring and pinion
- REPLACE the ring and pinion. REFER to Section 205-02 .
- Scraping noise - a continuous low pitched noise starting at low speeds
- Worn or damaged pinion bearings
- INSPECT and REPAIR or INSTALL new pinion bearings. REFER to Section 205-02 .
- Driveline shudder - occurs during acceleration from a slow speed or stop
- Rear drive axle assembly mispositioned
- CHECK the axle mounts and the rear suspension for damage or wear. REPAIR as necessary. REFER to Section 205-02 .
- Loose rear axle bolts
- CHECK the rear axle for loose bolts. TIGHTEN the bolts to specification. REFER to Section 205-02 .
- Driveline angles out of specification
- CHECK for correct driveline angles. REFER to Driveline Angle Measurement in this section.
- U-joints binding or seized
- ROTATE the driveshaft and CHECK for rough operation or seized U-joints. INSTALL new U-joints or driveshaft as necessary. REFER to Section 205-01 .
- Driveline vibration - occurs at cruising speeds
- Worn U-joints
- CHECK for wear or incorrect seating. INSTALL new U-joints or driveshaft as necessary. REFER to Section 205-01 .
- Loose axle pinion flange bolts
- INSPECT the axle pinion flange. TIGHTEN the pinion flange bolts to specification. REFER to Section 205-01 .
- Excessive axle pinion flange runout
- CARRY OUT a Pinion Flange Runout Check. REPAIR as necessary. REFER to Section 205-02 .
- Driveshaft is out-of-balance
- CHECK the driveshaft for damage, missing balance weights or undercoating. CHECK the driveshaft balance. CARRY OUT a driveline vibration test. REFER to Driveshaft Runout and Balancing in this section.
- Excessive driveshaft runout

- CARRY OUT a runout check. REFER to Driveshaft Runout and Balancing in this section.
- Driveline angles out of specification
- CHECK for correct driveline angles. REPAIR as necessary. REFER to Driveline Angle Measurement in this section.

### **Analysis of Leakage**

Clean up the leaking area enough to identify the exact source.

Inspect leaking area for any worn or damaged parts.

A plugged axle housing vent can cause excessive pinion seal lip wear due to internal pressure buildup.

Verify the axle lubricant level is at least 3-5 mm (1/8-3/16 in) below the bottom of the fill hole.

### **Axle Vent**

A plugged vent will cause excessive seal lip wear due to internal pressure buildup. If a leak occurs, check the vent. If the vent cannot be cleared, install a new vent.

### **Drive Pinion Seal**

Leaks at the drive pinion seal originate from the following causes:

- Damaged seal
- Worn seal journal surface

Any damage to the seal bore (dings, dents, gouges or other imperfections) distorts the seal casing and allows leakage past the outer edge of the drive pinion seal.

The drive pinion seal can be torn, cut or gouged if it is not installed correctly. The spring that holds the drive pinion seal against the pinion flange may be knocked out and allow fluid to pass the lip.

Metal chips trapped at the sealing lip can cause oil leaks. These can cause a wear groove on the drive pinion flange and result in pinion seal wear.

When a seal leak occurs, install a new drive pinion seal and check the vent to make sure it is clean and free of foreign material.

A new drive pinion flange must be installed if any of these conditions exist.

### **Drive Pinion Nut**

**NOTICE:** Install the drive pinion nut to the correct torque specifications or damage to the differential components may occur.

On some high-mileage vehicles, oil may leak through the threads of the drive pinion nut. This condition can be corrected by installing a new nut and applying threadlock and sealer on the threads and nut face.

### **Differential Seals**

**NOTICE:** When installing shafts, do not allow splines to contact seals during installation or damage to the seals may occur.

Halfshaft pilot bearing housing seals are susceptible to the same types of damage as drive pinion seals if incorrectly installed. The seal bore must be clean and the lip handled carefully to avoid cutting or tearing it. The seal journal surface must be free of nicks, gouges and rough surface texture.

For information on differential seals, refer to [Section 205-02](#).

## Component Tests

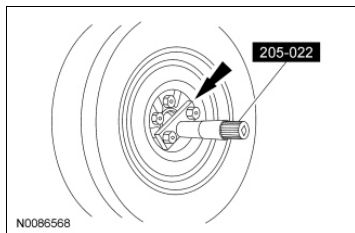
### Axle Vent

A plugged vent will cause excessive seal lip wear due to internal pressure buildup. If a leak occurs, check the vent. Make sure the vent hose is not kinked. Remove the hose from the vent nipple and clear the hose of any foreign material. While the hose is removed, pass a length of mechanic's wire or a small diameter Allen wrench in and out of the vent to clean it. Connect the hose when done.

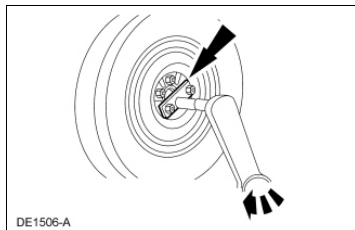
### Traction-Lok Differential Operation Check

A Traction-Lok differential can be checked for correct operation without removing it from the rear axle housing.

Raise only one rear wheel. Install the Differential Clutch Gauge on the wheel bolts.



Use a torque wrench with the capacity of at least 271 Nm (200 lb-ft) to rotate the axle shaft. Be sure that the transmission is in NEUTRAL, and that one rear wheel is on the floor while the other rear wheel is raised off the floor. The breakaway torque required to start rotation must be at least 27 Nm (20 lb-ft). The initial breakaway torque may be higher than the continuous turning torque.



The axle shaft must turn with even pressure throughout the check without slipping or binding. If the torque reading is less than specified, check the differential case. Refer to [Section 205-02](#).

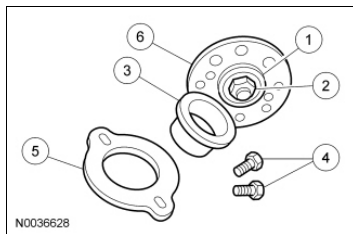
### Traction-Lok Differential Check Road Test

1. Place one wheel on a dry surface and the other wheel on ice, mud or snow.

2. Gradually open the throttle to obtain maximum traction prior to break away. The ability to move the vehicle demonstrates correct operation of a Traction-Lok rear axle assembly.
3. When starting with one wheel on an excessively slippery surface, a slight application of the parking brake may be necessary to help energize the Traction-Lok feature of the differential. Release the brake when traction is established. Use light throttle on starting to provide maximum traction.
4. If, with unequal traction, both wheels slip, the limited slip rear axle has done all it can possibly do.
5. In extreme cases of differences in traction, the wheel with the least traction may spin after the Traction-Lok has transferred as much torque as possible to the non-slipping wheel.

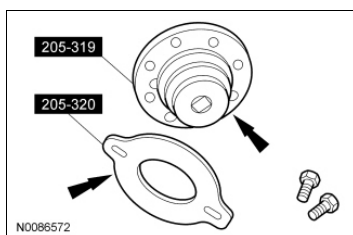
### Pinion Flange Runout Check - Circular

1. Check the pinion flange for damage.
2. Position Drive Pinion Flange Runout Gauge on the pinion flange.



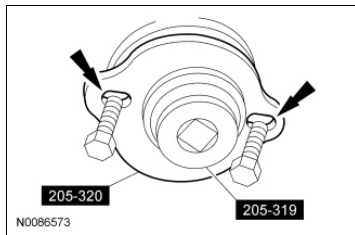
Item	Part Number	Description
1	-	Pilot (part of 205-319 [T92L-4851-b])
2	-	Pinion nut
3	205-319	Drive pinion flange runout gauge
4	-	Bolts (part of 205-320 [T92L-4851-C]) (2 required)
5	205-320	Driveshaft clamp plate
6	4851	Pinion flange

3. Position the Driveshaft Clamp Plate onto the Drive Pinion Flange Runout Gauge.

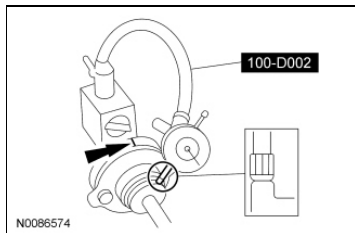


4. Align the holes on the Driveshaft Clamp Plate with the holes in the pinion flange and install the bolts. Snug the bolts evenly.

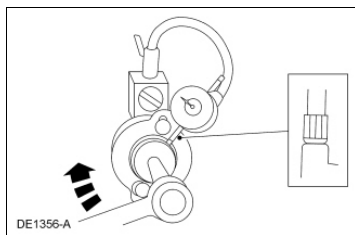




5. Position the Dial Indicator Gauge with Holding Fixture as shown. Turn the Drive Pinion Flange Runout Gauge, and locate and mark the high spot on the pinion flange with yellow paint.



6. If the flange runout exceeds 0.25 mm (0.010 in), remove the pinion flange, re-index the flange one-half turn on the pinion, and reinstall it. Refer to [Section 205-02](#) .
7. Check the runout again. If necessary, rotate the flange until an acceptable runout is obtained. If the flange runout is still more than 0.25 mm (0.010 in), install a new pinion flange.

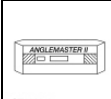


8. If excessive runout is still evident after installation of the pinion flange, install a new ring and pinion. Repeat the above checks until the runout is within specifications.



**Driveline Angle Measurement**

Special Tool(s)

	Anglemaster II Driveline Inclinometer/Protractor 164-R2402 or equivalent
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**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 419-03](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTE:** This procedure does not apply to CV-joints, flex couplers or double cardan joints that are used in some driveshafts. This check is for single cross and roller style joints found in the driveshafts.

**NOTE:** Prior to checking driveline angularity, inspect the U-joints for correct operation.

**NOTE:** An incorrect driveline angle can cause a vibration or shudder. For additional information, refer to [Section 100-04](#).

**NOTE:** Driveline angularity is the angular relationship between the engine crankshaft, the driveshaft and the rear axle pinion. Factors determining driveline angularity include ride height, rear spring and engine mounts.

**All vehicles**

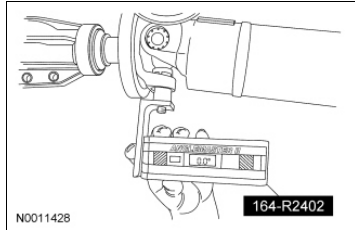
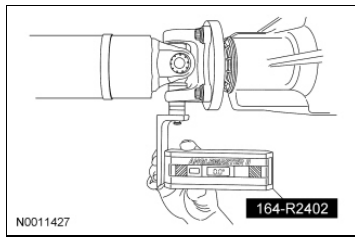
1. Carry out the following preliminary setup steps:
  - Inspect the U-joints for correct operation.
  - Park the vehicle on a level surface such as a drive-on hoist, or back onto a front end alignment rack.
  - Verify the curb position ride height is within specifications with the vehicle unloaded and all of the tires are inflated to their normal operating pressures.
  - Calibrate the Anglemaster II Driveline Inclinometer/Protractor by placing it on a clean, flat level section of the frame rail and press the ALT-ZERO button.

**Vehicles with flat flanged, split pin or slip flanged U-joints**

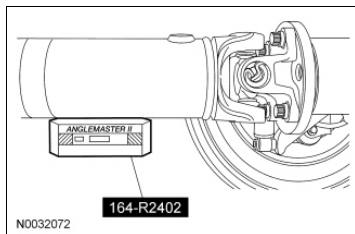
2. **NOTE:** If equipped, remove the snap ring to allow access to the base of the U-joint cup. Make sure the Anglemaster II Driveline Inclinometer/Protractor is seated against the U-joint cup.

**NOTE:** Rotate the driveshaft until the flange U-joint cup is parallel with the floor. This will simplify taking measurements.

To check the U-joint operating angle, install the Anglemaster II Driveline Inclinometer/Protractor. Check and record the flange angle as angle A.



3. Using the Anglemaster II Driveline Inclinometer/Protractor, measure the slope of the connecting component. Record the measurements of the component angle as angle B.

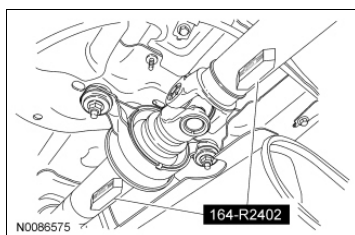


### Multiple piece driveshafts

4. **NOTE:** Repeat this step for each center support bearing on the driveshaft.

**NOTE:** It is not necessary to remove the U-joint snap ring, if equipped, for these measurements.

Using the Anglemaster II Driveline Inclinometer/Protractor, measure the slope of the components in front and behind the center support bearing U-joint in the area indicated. Record the front component as angle A and the rear component as angle B.



### All vehicles

5. **NOTE:** When 2 connected components slope in the same direction, subtract the smallest number from the larger number to find the U-joint operating angle. When 2 connected components slope in the opposite direction, add the measurements to find the U-joint operating angle.

Calculate the difference in the slope of the components to determine the U-joint operating angle.

- The U-joint operating angle is the angle formed by 2 yokes connected by a cross and bearing kit. Ideally, the operating angles on each connection of the driveshaft must:
  - ◆ be equal or within 1 degree of each other.

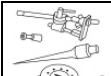

- ◆ have a 3 degree maximum operating angle.
- ◆ have at least one-half of 1 degree continuous operating angle.

6. If the angle is not within specifications, repair or adjust to obtain the correct angle. Inspect the engine mounts, transmission mounts, center support bearing mounting, rear suspension, rear axle, rear axle mounting or the frame for wear or damage.

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**Driveshaft Runout and Balancing**

## Special Tool(s)

 <small>ST1214-A</small>	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)
 <small>ST3025-A</small>	Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) 257-00018 or equivalent

**Driveshaft Inspection**

**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 419-03](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTE:** Driveline vibration exhibits a higher frequency and lower amplitude than high-speed shake. Driveline vibration is directly related to the speed of the vehicle and is noticed at various speeds. Driveline vibration can be perceived as a tremor in the floorpan or heard as a rumble, hum or boom.

**NOTE:** Refer to Specifications in this section for all runout specifications.

1. **NOTE:** Do not make any adjustments before carrying out a road test. Do not change the tire pressure or the vehicle load.

Carry out a visual inspection of the vehicle. Operate the vehicle and verify the condition by reproducing it during the road test.

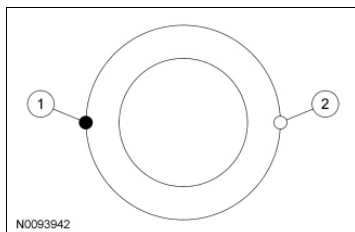
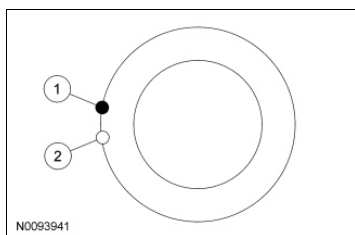
- The concern should be directly related to vehicle road speed, not affected by acceleration or deceleration, or could not be reduced by coasting in NEUTRAL.
2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .
    - The driveshaft should be kept at an angle equal to or close to the curb weighted position. Use a twin post hoist or a frame hoist with jackstands.
  3. Inspect the driveshaft for damage, undercoating or incorrectly seated U-joints. Rotate the driveshaft slowly by hand and feel for binding or end play in the U-joint trunnions. Remove and inspect the slip yoke splines for any galling, dirt, rust or incorrect lubrication. Clean the driveshaft or install new U-joints as necessary. Install a new driveshaft if damaged. After any corrections or new components are installed, recheck for the vibration at the road test speed.
    - If the vibration is gone, test drive the vehicle.
    - If the vibration persists or the driveshaft passes visual inspection, measure the driveshaft runout.

**Driveshaft Runout**

1. Install a Dial Indicator Gauge with Holding Fixture. Rotate the driveshaft by turning the axle and measure the runout at the front, the center and the rear of the driveshaft.
  - If the runout exceeds specifications at the front or center, install a new driveshaft.
  - If the front and center is within specification, but the rear runout is not, index-mark the rear runout high point and proceed to Step 2.
  - If the runout is within specification at all points, recheck for vibration at road test speed. If the vibration persists, balance the driveshaft. Proceed to Driveshaft Balancing in this procedure.
2. **NOTE:** Circular pinion flanges can be turned in 90 degree or one-fourth increments. Half round pinion flanges are limited to 2 positions.

Index-mark the driveshaft to the pinion flange. Disconnect the driveshaft and rotate it 180 degrees. Reconnect the driveshaft. Recheck the runout at the rear of the driveshaft.

- If the runout is still over specification, mark the high point and proceed to Step 3.
  - If the runout is within specification, check for the vibration at the road test speed. If the vibration is still present, balance the driveshaft. Proceed to Driveshaft Balancing in this procedure.
3. Excessive driveshaft runout can originate in the driveshaft itself or from the pinion flange. To find the source, compare the 2 high points previously determined.
    1. Original high runout point.
    2. High runout point after indexing.
      - ◆ If the index marks are close together, within 25 mm (1 in), the driveshaft is eccentric. Install a new driveshaft.
      - ◆ If the marks are on opposite sides of the driveshaft, 180 degrees apart, the slip yoke or pinion flange is responsible. Check the pinion flange runout. If the pinion flange runout exceeds specifications, a bent pinion is indicated.
      - ◆ If the pinion flange and pinion runouts are within specifications, road test and check for the vibration at the road test speed. If the vibration persists, balance the driveshaft. Proceed to Driveshaft Balancing in this procedure.

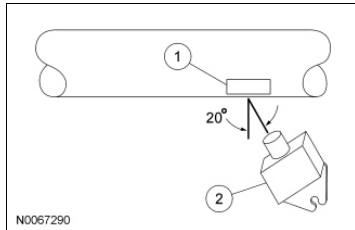


## Driveshaft Balancing - Using the MTS 4000

### All vehicles

1. Install the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix) to the vehicle.

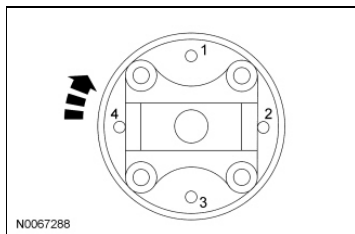
2. Working under the vehicle, install an accelerometer. The accelerometer can be attached and mounted near either the transmission or differential end of the driveshaft.
3. Clean an area of the driveshaft and install the reflective tape, then install the photo-tachometer sensor. The sensor should be placed at approximately a 20 degree angle from perpendicular to the surface of the reflective tape. Make sure the sensor does not get moved during the balance procedure.
  1. Reflective tape.
  2. Photo-tachometer sensor.



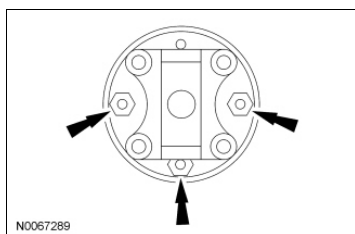
4. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a driveshaft balance test with the driveshaft unmodified.

#### Vehicles with tapped pinion flanges

5. Label the tapped holes in the pinion flange numerically, starting at the top hole as 1. Mark the remaining holes 2, 3 and 4. Label in the direction of rotation.



6. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a second test with the 12 mm (0.47 in) test weight set screw in the No. 1 hole, previously marked on the pinion flange.
7. Remove the test weight, then install the weight combination directed by the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix).



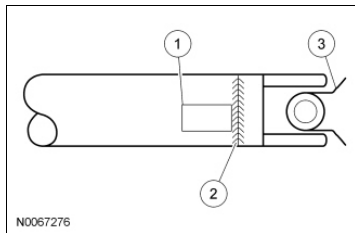
#### Vehicles without tapped pinion flanges

8. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a second test with a test weight. Using a metal band, secure the test weight to the end of the driveshaft. The weight should be placed at the end of the driveshaft tube, as close to the tube-to-yoke weld seam as possible. Mark the location of the test weight on the driveshaft.
  1. Test weight.
  2. Tube-to-yoke weld seam.



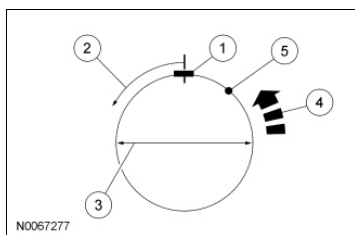
3. Driveshaft pinion flange.

- Select the test weight based on driveshaft size. Larger driveshafts use 10 grams. Smaller driveshafts use 5 grams.



9. Remove the test weight, then install the recommended weight at the position directed by the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix). Using a metal band and epoxy, secure the test weight to the driveshaft.

1. Test weight.
  2. Measure in this direction.
  3. Driveshaft diameter.
  4. Directional rotation.
  5. Balance weight relative to test weight centerline.
- The results are displayed with respect to the location to where the test weight was placed.

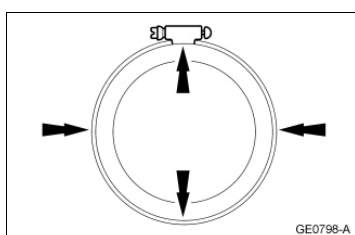


## All vehicles

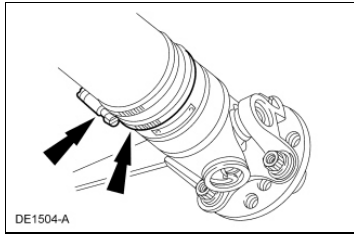
10. Using the Mastertech® Series MTS 4000 Driveline Balance and NVH Analyzer (Vetronix), run a third test to verify the repair.

## Driveshaft Balancing - Hose Clamp Method

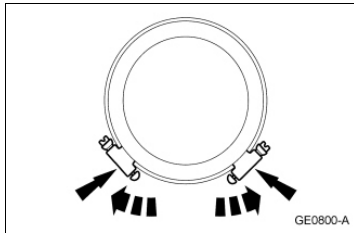
1. Install 1 or 2 hose clamps on the driveshaft, near the rear. Position of the hose clamp head(s) can be determined through trial and error.
2. Mark the rear of the driveshaft into 4 approximately equal sectors and number the marks 1 through 4. Install a hose clamp on the driveshaft with its head at position No. 1. Check for vibration at road speed. Recheck with the clamp at each of the other positions to find the position that shows minimum vibration. If 2 adjacent positions show equal improvement, position the clamp head between them.



3. If the vibration persists, add a second clamp at the same position and recheck for vibration.



4. If no improvement is noted, rotate the clamps in opposite directions, equal distances from the best position determined in Step 2. Separate the clamp heads about 13 mm (1/2 in) and recheck for vibration at the road speed.



5. Repeat the process with increasing separation until the best combination is found or the vibration is reduced to an acceptable level.
-

SECTION 205-01: Driveshaft  
SPECIFICATIONS2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

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## Material

Item	Specification	Fill Capacity
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B	-
Threadlock and Sealer TA-25	WSK-M2G351-A5	-

## Torque Specifications

Description	Nm	lb-ft
Driveshaft flange bolts	112	83

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**Driveshaft**

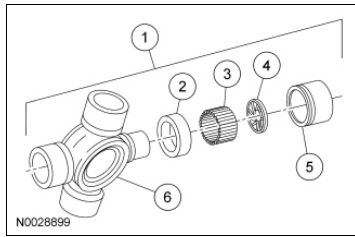
**NOTE:** Use caution when handling the driveshaft. Any slight dent in the driveshaft could result in a vibration.

The driveshaft has the following features:

- a fully retained U-joint pinion flange for a positive engagement with the rear axle.
- a splined slip-yoke permits the driveshaft to move forward and rearward on the transmission output shaft during drivetrain movement to maintain the required varying driveshaft length during normal vehicle operation.
- conventional U-joints that allow a smooth rotation of the driveshaft through the constantly varying angles the driveshaft encounters during jounce and rebound.

The driveshaft is a tubular shaft that transfers the rotational torque from the transmission to the rear drive axle. The tube can be aluminium or steel and the diameter of the tubes can vary, depending on the application. All driveshafts are balanced as assemblies. If the vehicle is to be undercoated, cover the driveshaft assembly to prevent overspray of any undercoating material.

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**Universal Joints**

Item	Part Number	Description
1	4635	U-joint
2	-	Grease seal (part of 4635)
3	-	32 needle bearings (part of 4635)
4	-	Thrust washer (part of 4635)
5	-	Bearing cup (part of 4635)
6	-	Spider (part of 4635)

U-joints have:

- a lubed-for-life design.
- nylon thrust washers, located at each base of the bearing cup, which control end play, position the needle bearings and improve grease movement.
- 1350 series U-joints (standard) with a 92.07 mm (3-5/8 in) span (span measurements are with bearing cups fully seated on the spider) and 30.18 mm (1-3/16 in) bearing cups.
- snap rings that fit into grooves in the U-joints housing for accurate alignment of the spider and the center of the driveshaft tube.

U-joints maintain a smooth rotational transition through an allowable angle variation during normal vehicle operation. The acceleration and deceleration of the driveshaft is controlled by needle bearings found in the cup.



## **Driveshaft**

Refer to Section 205-00 .

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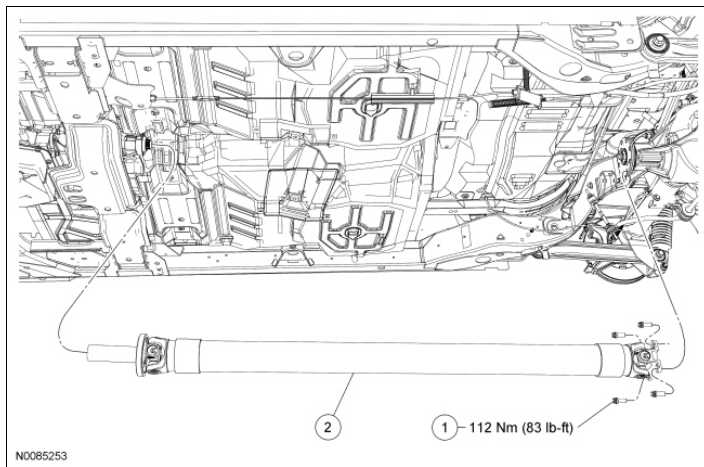
SECTION 205-01: Driveshaft  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

## Driveshaft

### Material

Item	Specification
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B



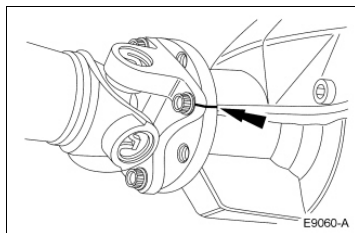
Item	Part Number	Description
1	N800594	Driveshaft attaching bolt (4 required)
2	4602	Driveshaft

### Removal and Installation

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

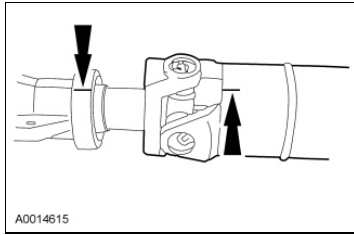
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

- Index-mark the rear axle pinion flange and the driveshaft centering socket yoke.



- Index-mark the transmission extension housing and driveshaft tube.

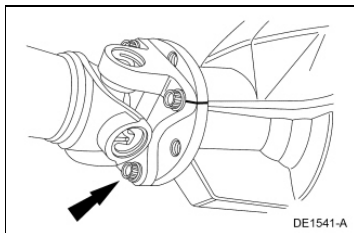




4. **NOTE:** If new driveshaft flange bolts are not available, coat the threads of the original bolts with the threadlock and sealer.

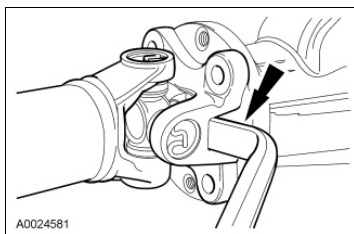
Remove and discard the 4 bolts.

- To install, tighten to 112 Nm (83 lb-ft).



5. **NOTE:** The driveshaft centering socket yoke fits tightly on the rear axle pinion flange pilot. Never hammer on the driveshaft or any of its components to disconnect the yoke from the flange. Pry only in the area shown, with a suitable tool, to disconnect the yoke from the flange.

Using a suitable tool as shown, disconnect the driveshaft centering socket yoke from the rear axle pinion flange.



6. **NOTE:** Align index marks before removing the driveshaft.

Lower the rear end of the driveshaft to clear the rear axle housing. Pull the driveshaft rearward until the driveshaft slip yoke clears the transmission extension housing.

- Plug the extension housing to prevent fluid loss.

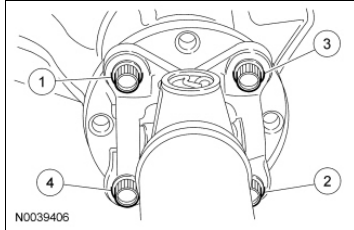
7. **NOTICE:** The driveshaft centering socket yoke fits tightly on the rear axle pinion flange pilot. To make sure that the yoke seats squarely on the flange, tighten the bolts evenly in a cross pattern as shown or damage to the component may occur.

**NOTE:** Lubricate the slip-yoke spline with long-life grease.

**NOTE:** If, after installing a new driveshaft, a vibration is encountered, align the factory-made yellow paint mark at the rear of the driveshaft tube with the factory-made yellow paint mark on the rear axle pinion flange as closely as possible. If the paint marks are not visible, refer to [Section 205-00](#) for driveshaft balancing.

**NOTE:** Inspect the mating surfaces on the rear axle pinion flange and the driveshaft centering socket yoke for foreign material and for damage from nicks or burrs that could prevent the flanges from fitting tightly together. Repair damaged areas or install new components as necessary to make sure a tight fit is obtained.

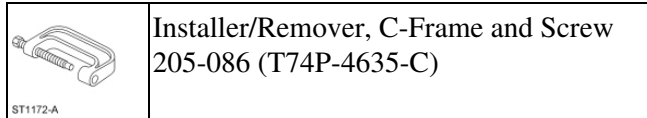
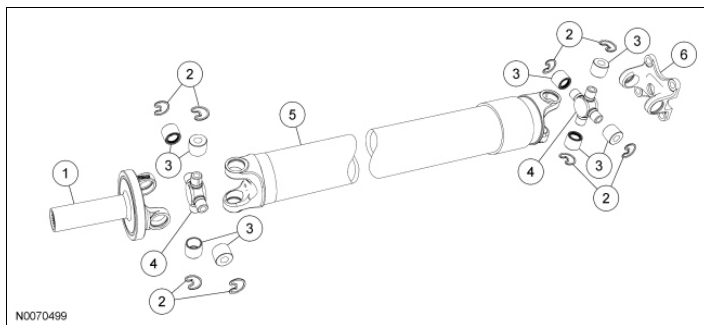
To install, reverse the removal procedure.



8. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

Repower the fire suppression system.

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**Driveshaft Universal Joint****Special Tool(s)****Universal Joint**

Item	Part Number	Description
1	4841	Driveshaft slip yoke
2	-	Snap rings (4 required) (part of 4635)
3	-	Bearing cups (part of 4635)
4	-	Spiders (part of 4635)
5	4602	Driveshaft
6	4782	Driveshaft centering socket flange

**Disassembly**

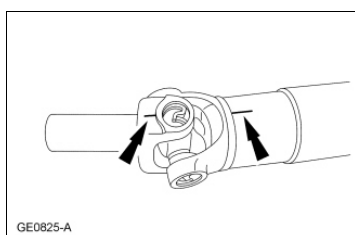
1. Remove the driveshaft. For additional information, refer to Driveshaft in this section.

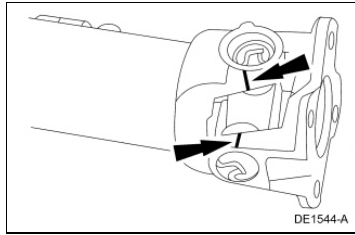
2. **NOTE:** Do not clamp the driveshaft in the jaws of a vise or a similar holding fixture.

Place the driveshaft on a suitable workbench.

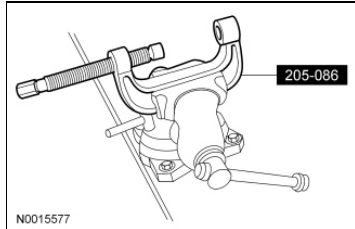
3. **NOTE:** Mark the positions of the driveshaft components relative to the driveshaft tube. Make sure all components are reassembled in the same relationship to maintain correct balance.

Index-mark the driveshaft and driveshaft components.

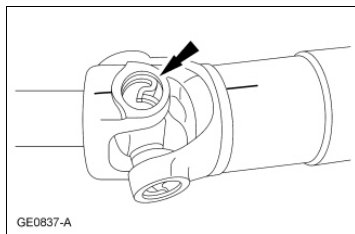




4. Clamp the C-Frame and Screw Installer/Remover in a vise.



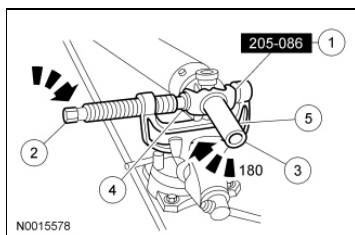
5. Remove the snap rings.



6. **NOTE:** If the bearing cup cannot be pressed all the way out, remove it with vise grips.

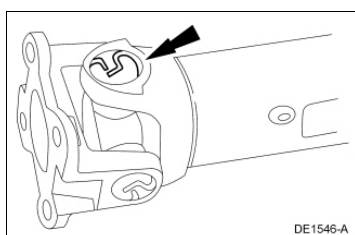
Remove the driveshaft slip yoke.

1. Position the driveshaft in the C-Frame and Screw Installer/Remover.
2. Press out a bearing cup.
3. Rotate the driveshaft 180 degrees.
4. Press on the spider to remove the bearing cup from the opposite side.
5. Remove the driveshaft slip yoke.



7. Remove the remaining bearing cups and the spider.

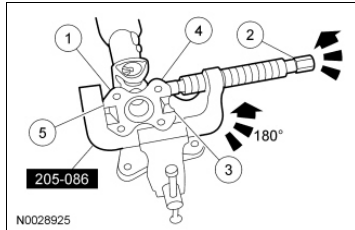
8. Remove the snap rings from the driveshaft centering socket yoke end.



9. **NOTE:** If the bearing cup cannot be pressed all the way out, remove it with vise grips.

Remove the driveshaft centering socket yoke.

1. Position the driveshaft in the C-Frame and Screw Installer/Remover.
2. Press out a bearing cup.
3. Rotate the driveshaft 180 degrees.
4. Press on the spider to remove the bearing cup from the opposite side.
5. Remove the driveshaft centering socket yoke.



10. Remove the remaining bearing cups and the spider.

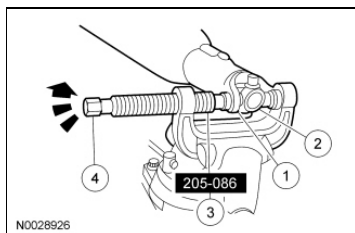
11. Clean the driveshaft yoke area at each end of the driveshaft.

- Inspect the driveshaft and driveshaft components for wear or damage.

## Assembly

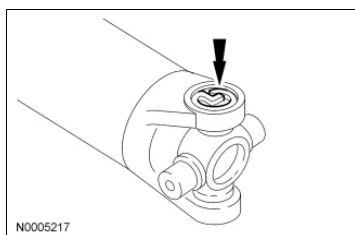
**NOTE:** U-joint service kits are to be installed as complete assemblies only. Do not use components from other U-joints.

1. Install a new bearing cup.
  1. Start a new bearing cup into the driveshaft yoke.
  2. Position a new spider in the driveshaft yoke.
  3. Install the driveshaft into the C-Frame and Screw Installer/Remover.
  4. Press the bearing cup below the yoke surface.



2. **NOTE:** Use the yellow snap rings supplied in the universal kit. If difficulty is encountered installing the yellow snap rings, install the black snap rings also supplied in the kit.

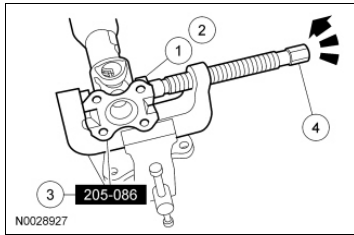
Remove the driveshaft from the C-Frame and Screw Installer/Remover and install the snap ring.



3. Repeat Steps 1 and 2 for the opposite side.

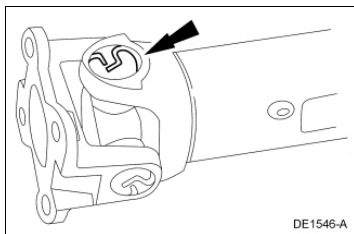
4. Install a new bearing cup.

1. Start a new bearing cup into the driveshaft centering socket yoke.
2. Position a new spider in the driveshaft yoke.
3. Install the driveshaft into the C-Frame and Screw Installer/Remover.
4. Press the bearing cup below the yoke surface.



5. **NOTE:** Use the yellow snap rings supplied in the universal kit. If difficulty is encountered installing the yellow snap rings, install the black snap rings also supplied in the kit.

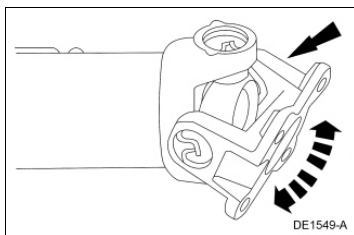
Remove the driveshaft from the C-Frame and Screw Installer/Remover and install the snap ring.



6. Repeat Steps 4 and 5 for the opposite side.

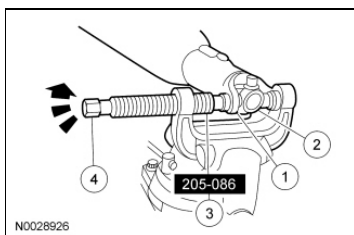
7. **NOTE:** Do not strike the bearings. If binding, strike the yoke with a brass or plastic hammer.

Check the U-joint for freedom of movement.



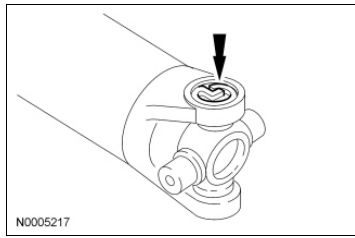
8. Install a new bearing cup.

1. Start a new bearing cup into the driveshaft yoke.
2. Position a new spider in the driveshaft yoke.
3. Install the driveshaft into the C-Frame and Screw Installer/Remover.
4. Press the bearing cup 6.3 mm (0.25 in) below the yoke surface.



9. **NOTE:** Use the yellow snap rings supplied in the universal kit. If difficulty is encountered installing the yellow snap rings, install the black snap rings also supplied in the kit.

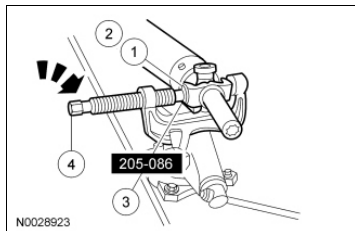
Remove the driveshaft from the C-Frame and Screw Installer/Remover and install the snap ring.



10. Repeat Steps 8 and 9 for the opposite side.

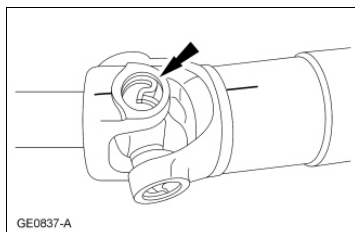
11. Install a new bearing cup.

1. Start a new bearing cup into the driveshaft slip yoke.
2. Position the slip yoke on the spider.
3. Install the driveshaft into the C-Frame and Screw Installer/Remover.
4. Press the bearing cup 6.3 mm (0.25 in) below the yoke surface.



12. **NOTE:** Use the yellow snap rings supplied in the universal kit. If difficulty is encountered installing the yellow snap rings, install the black snap rings also supplied in the kit.

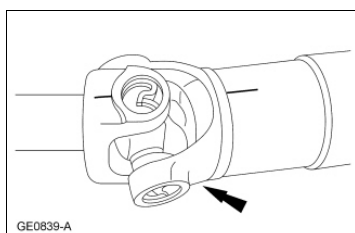
Remove the driveshaft from the C-Frame and Screw Installer/Remover and install the snap ring.



13. Repeat Steps 11 and 12 for the opposite side.

14. **NOTE:** Do not strike the bearings. If binding, strike the yoke with a brass or plastic hammer to seat the bearing cups.

Check the U-joint for freedom of movement.







SECTION 205-02: Rear Drive Axle/Differential - Ford  
 8.8-Inch Ring Gear  
 SPECIFICATIONS

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 01/26/2011

Material

Item	Specification	Fill Capacity
Additive Friction Modifier XL-3 (US); CXL-3 (Canada)	EST-M2C118-A	118 ml (4 oz)
Motorcraft® High Contrast Hypoid Gear Marking Compound XG-14	-	-
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5	2.37L (5.0 pt)
Motorcraft® SAE 80W-90 Premium Rear Axle Lubricant XY-80W90-QL (US); CXY-80W90-1L (Canada)	WSP-M2C197-A	2.37L (5.0 pt)
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Threadlock and Sealer TA-25	WSK-M2G351-A5	-

General Specifications

Item	Specification
<b>Clearance, Tolerance and Adjustments</b>	
Backlash between differential ring gear and pinion teeth	0.203-0.305 mm (0.008-0.012 in)
Maximum axle shaft end play	0.762 mm (0.030 in)
Maximum differential case runout	0.076 mm (0.003 in)
Maximum differential ring gear backlash variation between teeth	0.102 mm (0.004 in)
Maximum pinion runout (Total Indicated Runout (TIR))	0.25 mm (0.010 in)
Pinion bearing preload	1.8-3.3 Nm (16-29 lb-in)

Torque Specifications

Description	Nm	lb-ft	lb-in
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Differential bearing cap bolt	105	77	-
Differential housing cover bolt <sup>a</sup>	-	-	-
Differential housing cover tag bolt	31	23	-
Differential pinion bearing preload <sup>a</sup>	-	-	-
Differential pinion shaft lock bolt	30	22	-
Differential ring gear bolt <sup>a</sup>	-	-	-
Driveshaft bolts	112	83	-
Fill plug	30	22	-
Handle for Pinion Depth Gauge	2.2	-	20
Lower arm-to-axle nut	150	111	-
Parking brake cable wireform bracket bolts	17	-	150
Rear brake anti-lock sensor bolt	7	-	62
Shock absorber lower nut	90	66	-
Traction-Lok gauge nut	7	-	62
Upper arm-to-axle bolt	90	66	-
Watts linkage pivot nut	250	184	-
Wheel speed sensor bolts	7	-	62

<sup>a</sup> Refer to the procedure in this section.

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**Rear Drive Axle and Differential**

The 8.8-in rear axle assembly contains the following features:

- integral-type housing hypoid gear design with the centerline of the pinion set below the centerline of the ring gear.
- hypoid ring and pinion, which consists of a ring gear and an overhung drive pinion which is supported by 2 opposed pinion bearings.
- pinion bearing preload that is maintained by a drive pinion collapsible spacer on the pinion stem and adjusted by the pinion nut.
- differential housing assembly of a cast center section, 2 steel tube assemblies, a steel differential housing cover and a Watts linkage assembly.
- differential housing cover that uses a silicone sealant rather than a gasket.
- differential case that is a 1-piece design with 2 openings to allow for assembly of internal components and lubricant flow.
- differential pinion shaft that is retained by a differential pinion shaft lock bolt assembled to the differential case.
- differential case that is mounted in the rear axle housing between 2 opposed tapered roller differential bearings.
- differential bearing cups that are retained in the rear axle housing by removable bearing caps.
- differential bearing preload and ring gear backlash adjusted by the differential bearing shim located between the differential bearing cup and the rear axle housing.
- differential which comes in either the conventional open style or a Traction-Lok design.
- semi-floating axle shafts that are held in the housing by U-washers positioned in the slot on the axle shaft splined end.
- U-washers that fit into a recess in the differential side gears within the differential case.

The rear axle assembly receives rotational input from the driveshaft through a piloted pinion flange. The drive pinion drives the ring which is bolted to the differential case. The design of the differential allows the side gears in the case to rotate at different speeds. The axle shafts are splined to the side gears permitting the vehicle to manipulate corners without sliding the inside tire. The weight of the vehicle is carried through the axle shaft bearing located in the tubes of the axle housing.

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SECTION 205-02: Rear Drive Axle/Differential - Ford  
8.8-Inch Ring Gear  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 04/19/2011

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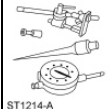
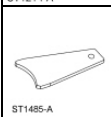
## **Rear Drive Axle and Differential**

Refer to Section 205-00 .

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**Ring Gear Backlash Adjustment**

## Special Tool(s)

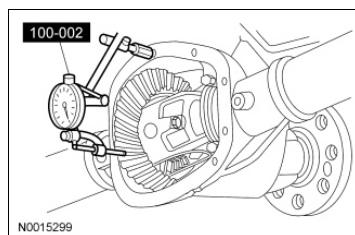
 ST1214-A	Dial Indicator Gauge With Holding Fixture 100-002 (TOOL-4201-C)
 ST1485-A	Installer, Differential Shim 205-220 (T85L-4067-AH)

## Material

Item	Specification
Motorcraft® High Contrast Hypoid Gear Marking Compound XG-14	-

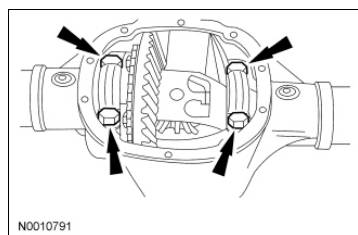
**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

1. Remove the differential housing cover. For additional information, refer to **Differential Housing Cover** in this section.
2. Install the Dial Indicator Gauge with Holding Fixture and measure the ring gear backlash.
  - If a zero backlash condition occurs or the backlash is not within specification, proceed to Step 3.
  - If the backlash is within specification, proceed to Step 14.



3. Remove the axle shafts. For additional information, refer to **Axle Shaft** in this section.
4. **NOTE:** Index-mark the position of the differential bearing caps, as arrows may not be visible. The differential bearing caps must be installed in their original locations and positions.

Remove the 4 bearing cap bolts and 2 caps.



5. If a zero backlash condition had occurred, add 0.50 mm (0.020 in) to the RH side shim and subtract 0.50 mm (0.020 in) from the LH side shim to allow a backlash indication. Install the 2 bearing caps and 4 bolts.
  - Tighten to 105 Nm (77 lb-ft).
  - Go back to Step 2.
6. To correct for high or low backlash, increase the thickness of one differential bearing shim and decrease the thickness of the other differential bearing shim by the same amount. Refer to the following tables when adjusting the backlash.

Backlash Change Required		Thickness Change Required	
mm	Inch	mm	Inch
0.025	0.001	0.050	0.002
0.050	0.002	0.050	0.002
0.076	0.003	0.101	0.004
0.101	0.004	0.152	0.006
0.127	0.005	0.152	0.006
0.152	0.006	0.203	0.008
0.177	0.007	0.254	0.010
0.203	0.008	0.254	0.010
0.228	0.009	0.304	0.012
0.254	0.010	0.355	0.014
0.279	0.011	0.355	0.014
0.304	0.012	0.406	0.016
0.330	0.013	0.457	0.018
0.335	0.014	0.457	0.018
0.381	0.015	0.508	0.020

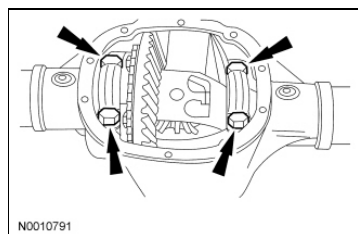
#### Differential Shim Size Chart 4067

Stripes and Color Code	Dimension A	
	mm	Inch
2 - C-COAL	7.7978-7.8105	0.3070-0.3075
1 - C-COAL	7.7470-7.7597	0.3050-0.3055
5 - BLU	7.6962-7.7089	0.3030-0.3035
4 - BLU	7.6454-7.6581	0.3010-0.3015

3 - BLU	7.5946-7.6073	0.2990-0.2995
2 - BLU	7.5458-7.5565	0.2970-0.2975
5 - PINK	7.4422-7.4549	0.2930-0.2935
4 - PINK	7.3914-7.4041	0.2910-0.2915
3 - PINK	7.3406-7.3533	0.2890-0.2895
2 - PINK	7.2898-7.3025	0.2870-0.2875
1 - PINK	7.2390-7.2517	0.2850-0.2855
5 - GRN	7.1882-7.2009	0.2830-0.2835
4 - GRN	7.1374-7.1501	0.2810-0.2815
3 - GRN	7.0866-7.0993	0.2790-0.2795
2 - GRN	7.0358-7.0485	0.2770-0.2775
1 - GRN	6.9850-7.0485	0.2750-0.2755
5 - WH	6.9342-6.9469	0.2730-0.2735
4 - WH	6.8834-6.8961	0.2710-0.2715
3 - WH	6.8326-6.8453	0.2690-0.2695
2 - WH	6.7818-6.7945	0.2670-0.2675
1 - WH	6.7310-6.7437	0.2650-0.2655
5 - YEL	6.6802-6.6929	0.2630-0.2635
4 - YEL	6.6294-6.6421	0.2610-0.2615
3 - YEL	6.5786-6.5913	0.2590-0.2595
2 - YEL	6.5278-6.5405	0.2570-0.2575
1 - YEL	6.4770-6.4897	0.2550-0.2555
5 - ORNG	6.4262-6.4389	0.2530-0.2535
4 - ORNG	6.3754-6.3881	0.2510-0.2515
3 - ORNG	6.3246-6.3373	0.2490-0.2495
2 - ORNG	6.2738-6.2865	0.2470-0.2475
1 - ORNG	6.2223-6.2357	0.2450-0.2455
2 - RED	6.1722-6.1849	0.2430-0.2435
1 - RED	6.1214-6.1341	0.2410-0.2415

7. Install the 2 bearing caps and 4 bolts.

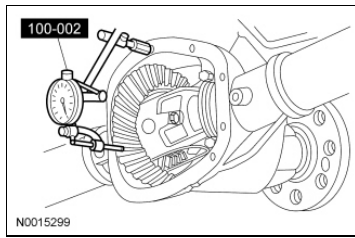
- Tighten to 105 Nm (77 lb-ft).



8. Using the Dial Indicator Gauge with Holding Fixture, recheck the ring gear backlash.

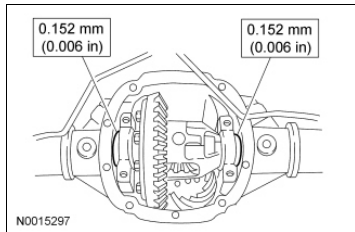
- If backlash is now within specification, proceed to Step 9.
- If backlash is not within specification, go back to Step 4.



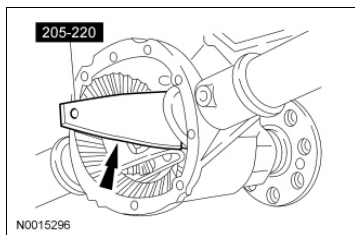


9. Remove the 4 bearing cap bolts and 2 bearing caps.

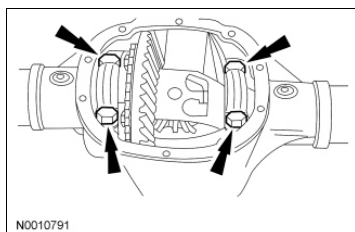
10. To establish differential bearing preload, increase both LH and RH differential bearing shim size by the thickness shown.



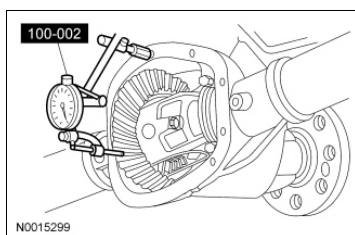
11. Using the Differential Shim Installer, fully seat the differential bearing shims. Make sure the assembly rotates freely.



12. Install the 2 bearing caps and 4 bolts.  
• Tighten to 105 Nm (77 lb-ft).




13. Using the Dial Indicator Gauge with Holding Fixture, do a final check of the ring gear backlash.



14. Apply marking compound and rotate the differential assembly 5 complete revolutions.

15. Verify an acceptable pattern check. For additional information, refer to Tooth Contact Pattern Check in [Section 205-00](#) .

16. Install the axle shafts. For additional information, refer to Axle Shaft in this section.
17. Install the differential housing cover. For additional information, refer to Differential Housing Cover in this section.
18.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

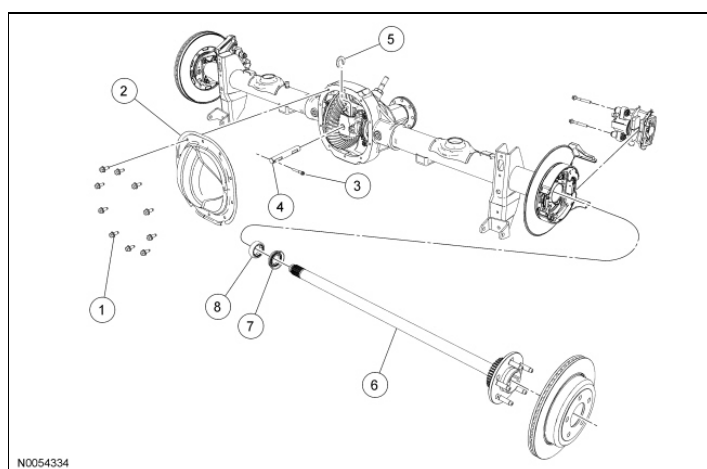
Repower the system.

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## Axle Shaft

### Material

Item	Specification
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B



Item	Part Number	Description
1	4346	Differential housing cover bolt (10 required)
2	4033	Differential housing cover
3	4241	Differential pinion shaft lock bolt
4	4211	Differential pinion shaft
5	4N237	Axle shaft U-washer
6	4234	Axle shaft
7	1177	Wheel bearing oil seal
8	1225	Rear wheel bearing

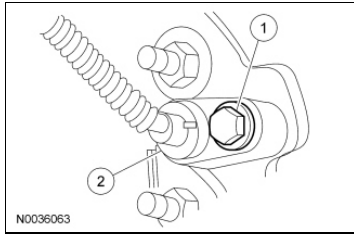
### Removal

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

**NOTE:** When removing the rear brake caliper in this procedure, it is not necessary to disconnect the hydraulic lines.

Remove the brake disc. For additional information, refer to [Section 206-04](#) .

- Position the rear brake anti-lock sensor aside.
  - Remove the bolt.
  - Remove the sensor and position it aside.

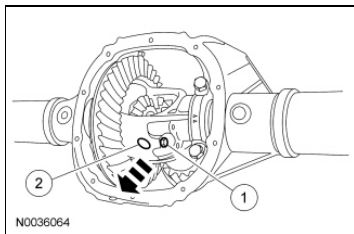


3. Remove the differential housing cover. For additional information, refer to Differential Housing Cover in this section.

4. **NOTICE:** Once the differential pinion shaft has been removed, turning the differential case or an axle shaft can cause the differential pinion gears to fall out of the assembly. This may result in damage to the component.

Remove the differential pinion shaft.

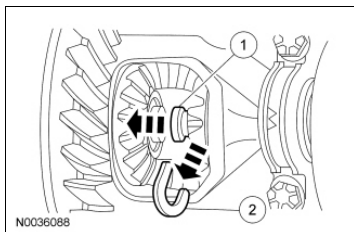
1. Remove the differential pinion shaft lock bolt.
2. Remove the differential pinion shaft.



5. **NOTE:** Do not damage the rubber O-ring in the axle shaft U-washer groove.

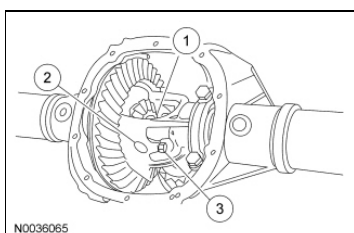
Remove the axle shaft U-washer.

1. Push the axle shaft inboard.
2. Remove the U-washer.



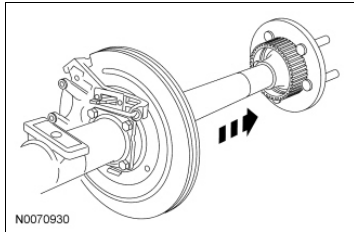
6. Reinstall the differential pinion shaft.

1. Push the axle shaft outboard.
2. Install the differential pinion shaft.
3. Install the differential pinion shaft lock bolt finger-tight.



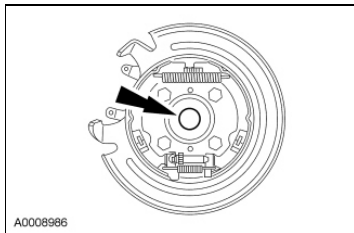
**7. NOTICE: Do not damage the wheel bearing oil seal.**

Remove the axle shaft.



**Installation**

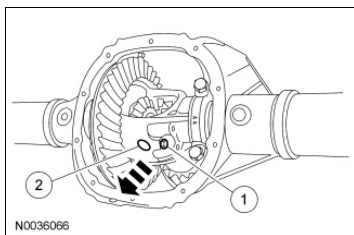
1. Lubricate the lip of the wheel bearing oil seal with grease.



2. **NOTICE: Once the differential pinion shaft has been removed, turning the differential case or an axle shaft can cause the differential pinion gears to fall out of the assembly. This may result in chipped or damaged components.**

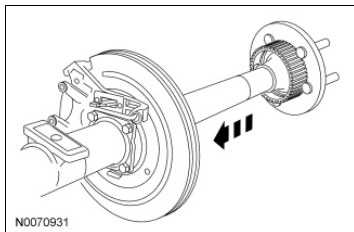
Remove the differential pinion shaft.

1. Remove the differential pinion shaft lock bolt and discard.
2. Remove the differential pinion shaft.



3. **NOTICE: Do not damage the wheel bearing oil seal.**

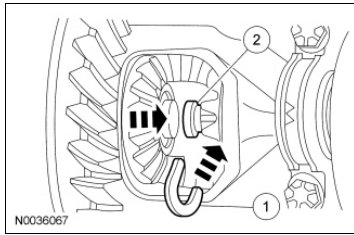
Install the axle shaft.



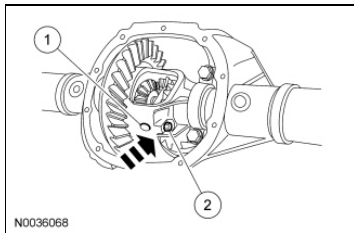
4. **NOTICE: Do not damage the rubber O-ring in the axle shaft U-washer groove.**

Install the axle shaft U-washer.

1. Position the U-washer on the button end of the axle shaft.
2. Pull the axle shaft outward to seat the U-washer in the side gear.



5. Install the differential pinion shaft.
  1. Align the hole in the differential pinion shaft with the lock bolt hole.
  2. Install a new differential pinion shaft lock bolt.
    - ◆ Tighten to 30 Nm (22 lb-ft).



6. Install the differential housing cover. For additional information, refer to Differential Housing Cover in this section.
7. Install the rear brake anti-lock sensor and bolt.
  - Tighten to 7 Nm (62 lb-in).
8. Install the brake disc. For additional information, refer to Section 206-04.
9. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B. Failure to follow these instructions may result in serious personal injury.**

Repower the system.







SECTION 205-02: Rear Drive Axle/Differential - Ford  
 8.8-Inch Ring Gear  
 IN-VEHICLE REPAIR

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

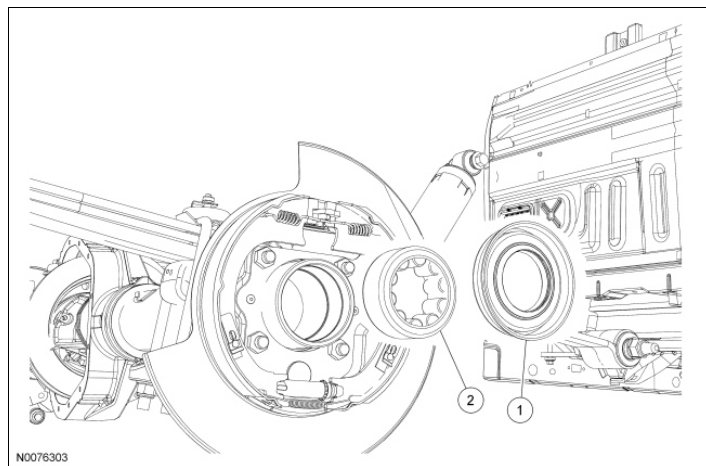
## Rear Wheel Bearing and Axle Shaft Seal

### Special Tool(s)

 ST1541A	Installer, Axle Shaft Bearing 205-124 (T78P-1225-A)
 ST1513A	Installer, Axle Shaft Oil Seal 205-123 (T78P-1177-A)
 ST2035-A	Remover, Axle Bearing 205-219 (T85L-1225-AH)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

### Material

Item	Specification
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B



Item	Part Number	Description
1	1177	Axle shaft oil seal
2	1225	Axle shaft bearing

### Removal



1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

Remove the axle shaft. For additional information, refer to **Axle Shaft** in this section.

2. **NOTE:** If the wheel bearing oil seal is leaking, the axle housing vent may be plugged with foreign material.

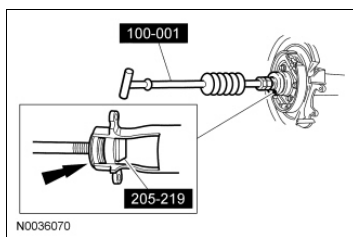
**NOTE:** If only the seal needs to be installed, use care to avoid damaging the seal bore.

Remove the oil seal from the axle tube.

- Discard the oil seal.

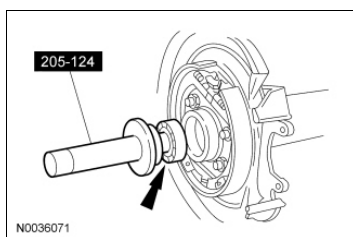
3. Inspect the rear wheel bearing and axle shaft bear surface for wear or damage.

4. If necessary, using the Slide Hammer and Axle Bearing Remover, remove the rear wheel bearing.

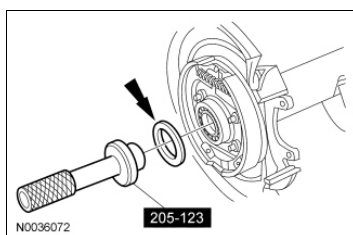


## Installation


1. Using rear axle lubricant, lubricate the new rear wheel bearing.
2. Using the Axle Shaft Bearing Installer, install the rear wheel bearing.



3. Using long-life grease, lubricate the lip of the new wheel bearing oil seal.
4. Using the Axle Shaft Oil Seal Installer, install the wheel bearing oil seal.



5. Install the axle shaft. For additional information, refer to **Axle Shaft** in this section.

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

Repower the system.





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SECTION 205-02: Rear Drive Axle/Differential - Ford  
 8.8-Inch Ring Gear  
 IN-VEHICLE REPAIR

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

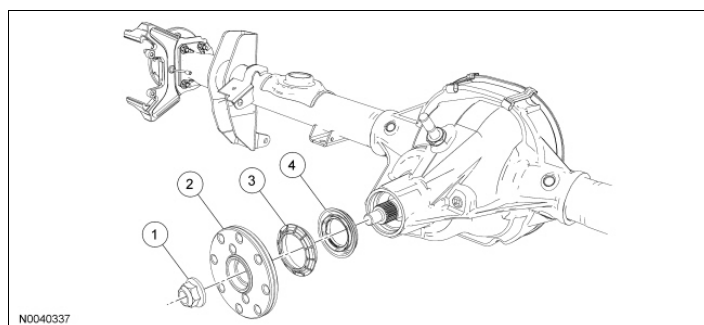
## Drive Pinion Flange and Drive Pinion Seal

### Special Tool(s)

 ST2025-A	2 Jaw Puller 205-D072 (D97L-4221-A) or equivalent
 ST1257-A	Holding Fixture, Drive Pinion Flange 205-126 (T78P-4851-A)
	Installer, Drive Pinion Flange 205-002 (TOOL-4858-E)
 ST1325-A	Installer, Drive Pinion Oil Seal 205-208 (T83T-4676-A)

### Material

Item	Specification
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B



Item	Part Number	Description
1	389546-S100	Differential drive pinion nut
2	4841	Differential drive pinion flange
3	-	Dust cover
4	4676	Differential drive pinion seal

### Removal

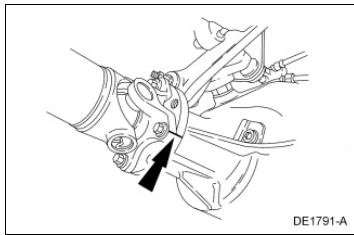
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

**NOTE:** Remove the rear brake discs to prevent brake drag during drive pinion bearing preload adjustment.

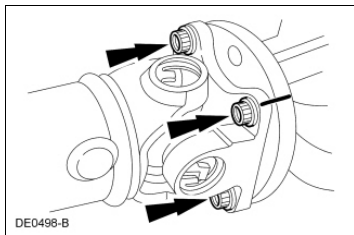
**NOTE:** When removing the rear brake caliper in this procedure, it is not necessary to disconnect the hydraulic lines.

Remove the brake discs. For additional information, refer to Section 206-04 .

2. Index-mark the driveshaft flange and pinion flange for correct alignment during installation.



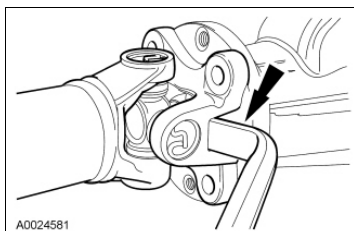
3. Remove the 4 driveshaft flange bolts.



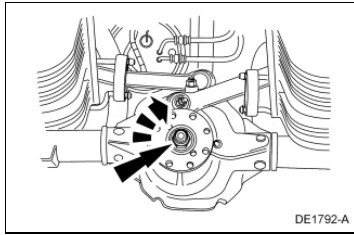
4. **NOTICE:** The driveshaft centering socket yoke fits tightly on the rear axle pinion flange pilot. Never hammer on the driveshaft or any of its components to disconnect the yoke from the flange. Pry only in the area shown with a suitable tool to disconnect the yoke from the flange or damage to the component may occur.

Using a suitable tool as shown, disconnect the driveshaft centering socket yoke from the rear axle pinion flange.

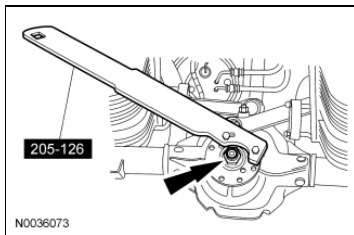
- Position the driveshaft aside.



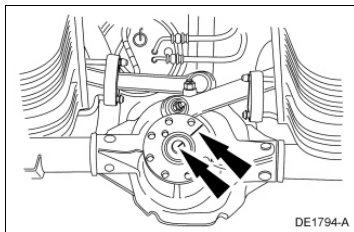
5. Install a Nm (lb-in) torque wrench on the nut and record the torque necessary to maintain rotation of the pinion through several revolutions.



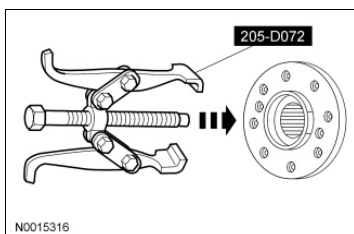
6. Use the Drive Pinion Flange Holding Fixture to hold the pinion flange while removing the nut.
  - Discard the nut.



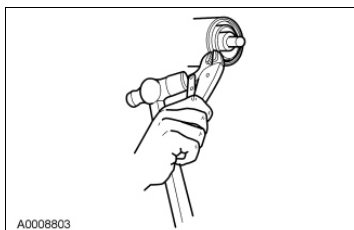
7. Index-mark the pinion flange and the drive pinion stem for correct alignment during installation.



8. Using the 2 Jaw Puller, remove the pinion flange.



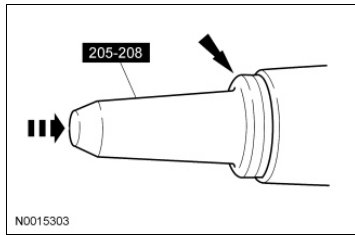
9. Force up on the metal flange of the drive pinion seal. Install gripping pliers and strike with a hammer until the drive pinion seal is removed.
  - Discard the seal.



## Installation

1. Coat the new rear axle drive pinion seal lips with grease.
2. **NOTE:** If the rear axle drive pinion seal becomes misaligned during installation, remove the seal and install a new seal.

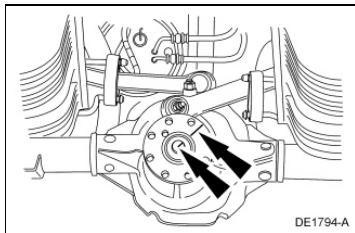
Using the Drive Pinion Oil Seal Installer, install the rear axle drive pinion seal.



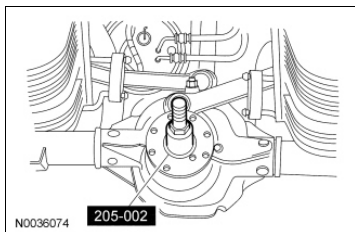
3. Lubricate the pinion flange splines with rear axle lubricant.

4. **NOTE:** Disregard the index marks if installing a new pinion flange.

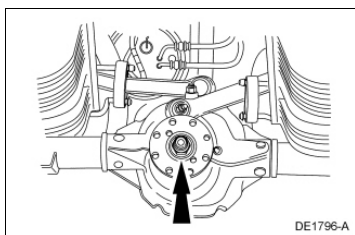
Position the pinion flange.



5. Using the Drive Pinion Flange Installer, install the pinion flange.



6. Position the new drive pinion nut.



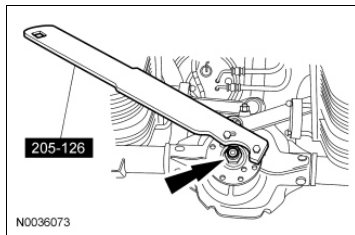
7. **NOTICE:** Do not, under any circumstance, loosen the nut to reduce preload or component damage may occur. If it is necessary to reduce preload, install a new collapsible spacer and nut.

**NOTE:** Remove the Drive Pinion Flange Holding Fixture while taking preload readings with the Nm (lb-in) torque wrench.

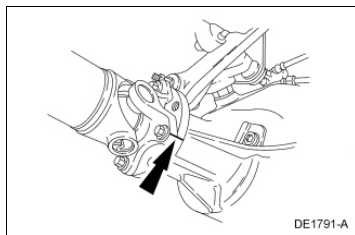
Use the Drive Pinion Flange Holding Fixture to hold the pinion flange while tightening the nut.

- Rotate the pinion occasionally to make sure the differential pinion bearings seat correctly. Take frequent differential pinion bearing preload readings by rotating the pinion with a Nm (lb-in) torque wrench.

- If the preload recorded prior to disassembly is lower than the specification, tighten the nut to specification. If the preload recorded prior to disassembly is higher than the specification, tighten the nut to the original reading as recorded.



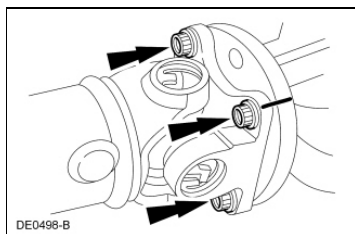
8. Align the index marks.



9. **NOTE:** The driveshaft centering socket yoke fits tightly on the rear axle pinion flange pilot. To make sure that the yoke seats squarely on the flange, tighten the bolts evenly in a cross pattern.

Position the driveshaft and install the 4 bolts.

- Tighten to 112 Nm (83 lb-ft).



10. Install the brake discs. For additional information, refer to [Section 206-04](#) .

11. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

Repower the system.

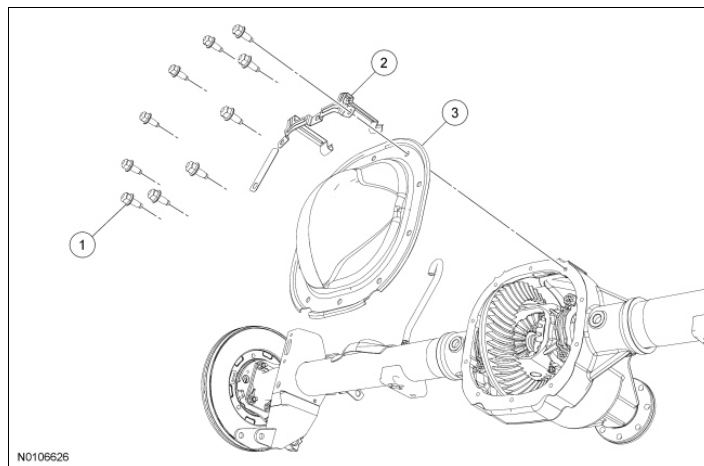




## Differential Housing Cover

### Material

Item	Specification
Additive Friction Modifier XL-3 (US); CXL-3 (Canada)	EST-M2C118-A
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5
Motorcraft® SAE 80W-90 Premium Rear Axle Lubricant XY-80W90-QL (US); CXY-80W90-1L (Canada)	WSP-M2C197-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4



Item	Part Number	Description
1	4346	Differential housing cover bolt (10 required)
2	2860	Park brake cable retaining bracket
3	4033	Differential housing cover

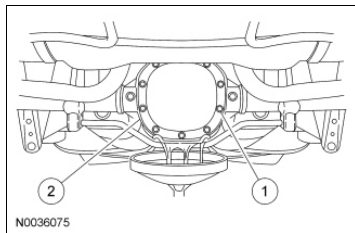
### Removal

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

- Remove the differential housing cover.

1. Remove the 10 differential housing cover bolts and drain the lubricant from the differential housing.
2. Remove the differential housing cover.



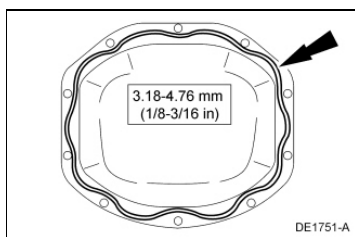
## Installation

1. **NOTE:** The machined surfaces on the differential housing and the differential housing cover must be clean and free of oil before applying the silicone sealant. Cover the inside of the rear axle prior to cleaning the machined surface to prevent contamination.

Clean the gasket mating surfaces.

2. **NOTE:** Install the differential housing cover within 15 minutes of applying the silicone or it will be necessary to apply new sealant.

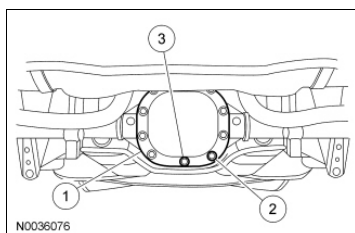
Apply a continuous bead of silicone gasket and sealant to the differential housing cover as shown.



3. **NOTE:** If possible, allow at least one hour before filling the axle with lubricant to allow the silicone sealant to cure.

Install the differential housing cover.

1. Position the differential housing cover.
2. Install the 9 bolts.
  - ◆ Tighten to 46 Nm (33 lb-ft).
3. Install the axle tag bolt.
  - ◆ Tighten to 31 Nm (23 lb-ft).



4. **NOTE:** For Traction-Lok axles, first fill the rear axle with 118 ml (4 oz) of additive friction modifier.

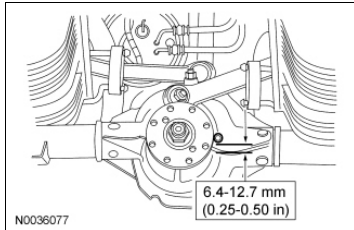
**NOTE:** Before attempting to remove the axle fill plug, make sure the tool recess is free of foreign material which may keep the tool from fully engaging the plug. Clean the recess with a small

screwdriver or similar tool. Make sure the tool can be fully inserted into the recess before attempting to remove the plug.

**NOTE:** Service refill lube type is determined by filling the rear axle with the specified lubricant on the axle tag. Fill to the level shown in the illustration.

Fill the rear axle with 2.37L (5.0 pt) of lubricant and install the fill plug.

- Tighten to 30 Nm (22 lb-ft).



5. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

Repower the system.














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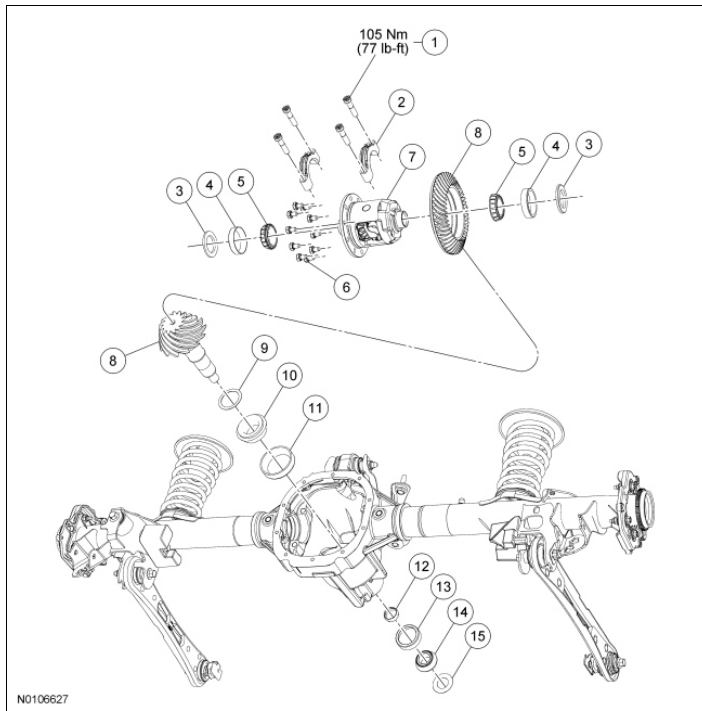
SECTION 205-02: Rear Drive Axle/Differential - Ford  
8.8-Inch Ring Gear  
IN-VEHICLE REPAIR

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

## Differential Ring And Pinion

### Special Tool(s)

 ST2025-A	2 Jaw Puller 205-D072 (D79L-4221-A1) or equivalent
 ST1743-A	Adapter for 205-S127 205-105 (T76P-4020-A3)
 ST1429-A	Adapter for 205-S127 205-109 (T76P-4020-A9)
 ST1431-A	Adapter for 205-S127 205-110 (T76P-4020-A10)
 ST1432-A	Adapter for 205-S127 205-111 (T76P-4020-A11)
 ST1743-A	Adapter for 205-S127 205-129 (T79P-4020-A18)
 ST1434-A	Adapter for 205-S127 205-130 (T79P-4020-A19)
 ST1375-A	Installer, Differential Side Bearing 205-010 (T57L-4221-A2)
 ST1367-A	Installer, Drive Pinion Bearing Cone 205-005 (T53T-4621-C)
 ST1678-A	Installer, Drive Pinion Bearing Cup 205-024 (T67P-4616-A)
 ST1254-A	Plate, Bearing Oil Seal 205-090 (T75L-1165-B)
 ST1744-A	Protector, Drive Pinion Thread 205-460 or equivalent
 ST1543-A	Step Plate 205-D016 (D80L-630-5) or equivalent



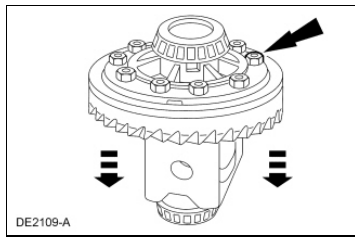
Item	Part Number	Description
1	-	Differential bearing cap bolt (part of 4010)
2	-	Differential bearing cap (part of 4010)
3	4067	Differential bearing shims (2 required)
4	4221	Differential bearing cups (2 required)
5	4222	Differential bearing cones (2 required)
6	4216	Differential ring gear bolt (10 required)
7	-	Differential carrier assembly
8	4209	Ring gear (set with drive pinion)
9	4663	Pinion bearing adjustment shim
10	4630	Inner pinion bearing
11	4628	Inner pinion bearing cup
12	4662	Collapsible spacer
13	4616	Outer pinion bearing cup
14	4621	Outer pinion bearing
15	4670	Pinion oil slinger

### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

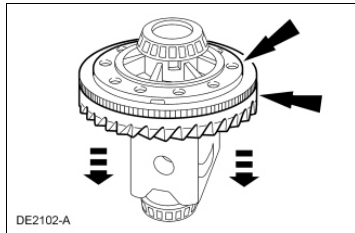
Remove the drive pinion flange seal. For additional information, refer to **Drive Pinion Flange and Drive Pinion Seal** in this section.

2. Remove the differential carrier. For additional information, refer to **Differential Carrier** in this section.
3. Remove and discard the 10 differential ring gear bolts.

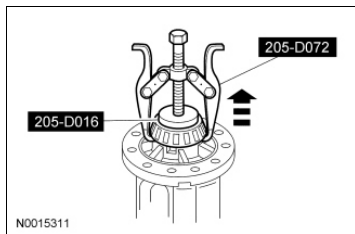


4. **NOTE:** Do not damage the differential ring gear bolt hole threads.

Insert a punch in the differential ring gear bolt holes and drive the differential ring gear off.

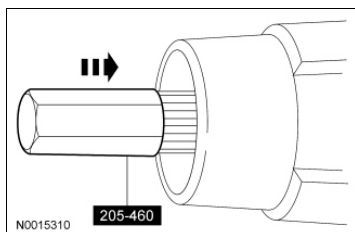


5. Using the 2 Jaw Puller and Step Plate, remove the 2 differential bearings.

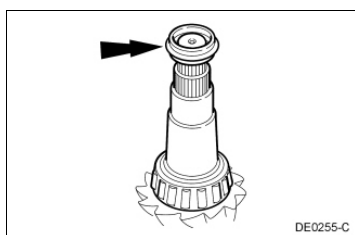


6. Remove the drive pinion shaft oil slinger and the outer drive pinion bearing.

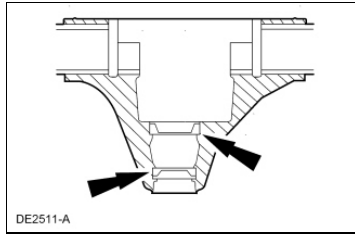
7. Install the Drive Pinion Thread Protector. Using a soft-faced hammer, drive the pinion assembly out of the axle housing.



8. Remove and discard the drive pinion collapsible spacer.

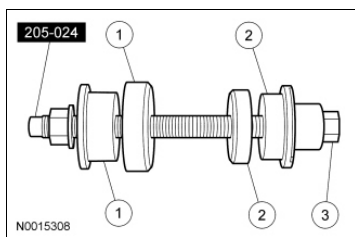


9. Using a brass drift, remove the drive pinion bearing cups by tapping alternately on opposite sides of the drive pinion bearing cups.

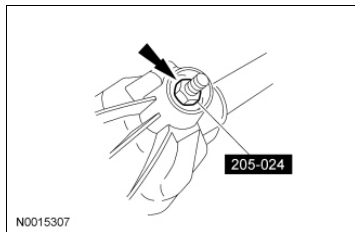


## Installation

1. Position the Drive Pinion Bearing Cup Installer and the inner and outer drive pinion bearing cups in their respective bores.
  1. After placing the inner and outer drive pinion bearing cups in their bores, place the Drive Pinion Bearing Cup Installer (inner) on the inner drive pinion bearing cup.
  2. Place the Drive Pinion Bearing Cup Installer (outer) on the outer drive pinion bearing cup.
  3. Install the Drive Pinion Bearing Cup Installer.

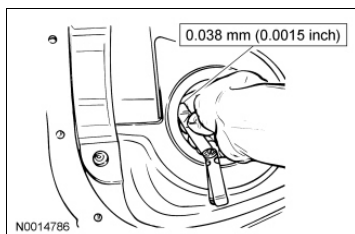


2. Tighten the Drive Pinion Bearing Cup Installer to seat the drive pinion bearing cups into their bores.



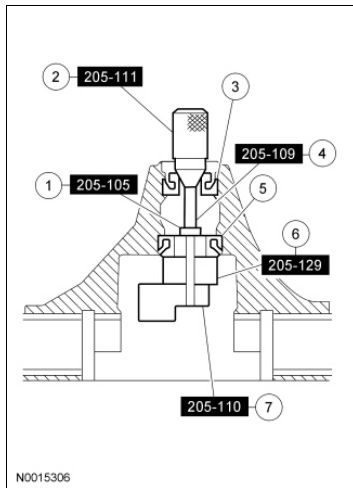
3. **NOTE:** If a feeler gauge can be inserted between a drive pinion bearing cup and the bottom of its bore at any point around the drive pinion bearing cup, the drive pinion bearing cup is not correctly seated.

Make sure the drive pinion bearing cups are correctly seated in their bores.



4. **NOTE:** Install new drive pinion bearings without any additional lubricant since the anti-rust oil provides adequate lubricant without upsetting the drive pinion bearing preload settings.

Assemble and position the Adapters for 205-S127.

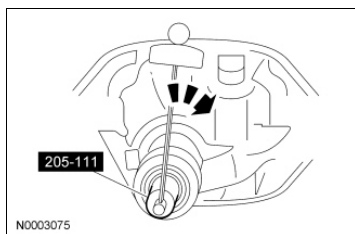


Item	Part Number	Description
1	205-105	Adapter for 205-S127 (1.612 inch OD) (T76P-4020-A3)
2	205-111	Adapter for 205-S127 (T76P-4020-A11)
3	4621	Drive pinion bearing (outer)
4	205-109	Adapter for 205-S127 (T76P-4020-A9)
5	4630	Drive pinion bearing (inner)
6	205-129	Adapter for 105-S127 (1.1884 inch thick) (T79P-4020-A18)
7	205-110	Adapter for 205-S127 (1.7 inch thick) (T76P-4020-A10)

5. **NOTE:** This step duplicates final drive pinion bearing preload.

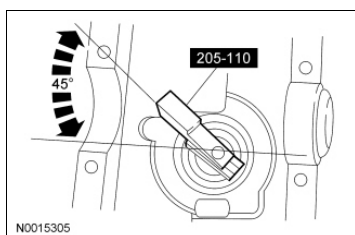
Tighten the Adapter.

- Tighten to 2.2 Nm (20 lb-in).



6. **NOTE:** The Adapter must be offset to obtain an accurate reading.

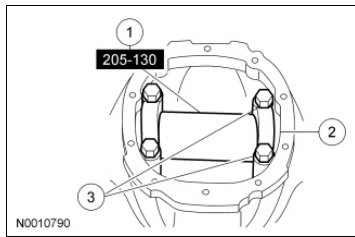
Rotate the Adapter several half-turns to make sure of correct seating of the drive pinion bearings.





7. Install the Adapter.

1. Position the Adapter.
  2. Install the 2 differential bearing caps.
  3. Install the 4 differential bearing cap bolts.
- ◆ Tighten to 105 Nm (77 lb-ft).

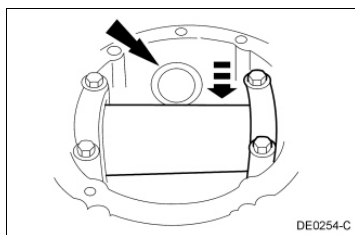


8. **NOTE:** Drive pinion bearing adjustment shims must be flat and clean.

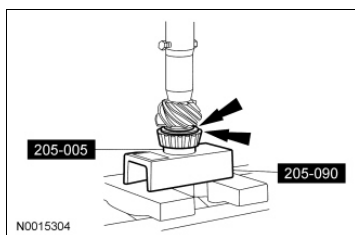
**NOTE:** A slight drag should be felt for correct drive pinion bearing adjustment shim selection. Do not attempt to force the drive pinion bearing adjustment shim between the gauge block and the gauge tube. This will minimize selection of a drive pinion bearing adjustment shim thicker than required, which results in a deep tooth contact in final assembly of integral axle assemblies.

Use a drive pinion bearing adjustment shim as a gauge for drive pinion bearing adjustment shim selection.

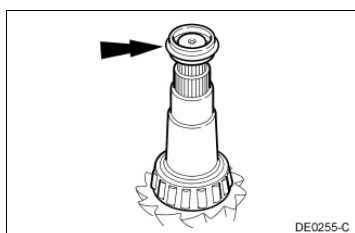
- After the correct drive pinion bearing adjustment shim thickness has been determined, remove all of the Adapters.



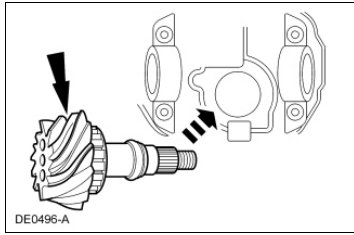
9. Using the Drive Pinion Bearing Cone Installer and Bearing Oil Seal Plate with a shop press, drive the inner drive pinion bearing and the selected drive pinion bearing adjustment shim until they are firmly seated on the pinion shaft.



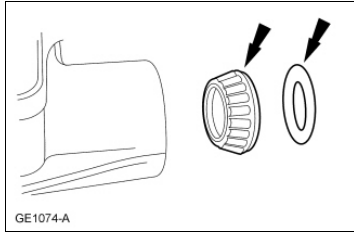
10. Install a new drive pinion collapsible spacer on the pinion shaft against the pinion shaft shoulder.



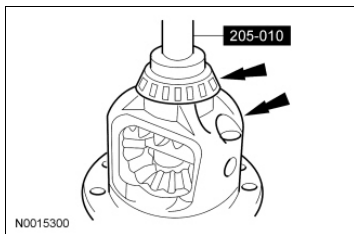
11. Install the drive pinion assembly into the axle housing.



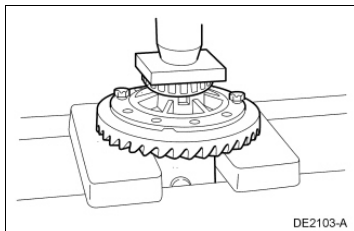
12. Install the outer drive pinion bearing and the drive pinion shaft oil slinger.



13. Using the Differential Side Bearing Installer, install the 2 new differential bearings.

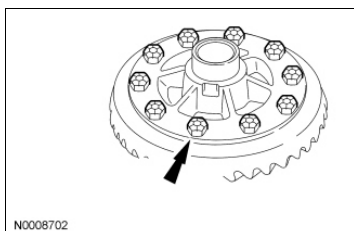


14. Using 2 ring gear bolts as a guide, press the ring gear on the differential assembly.




15. Install the 10 new differential ring gear bolts. Tighten in 2 stages.

- Stage 1: Tighten to 60 Nm (44 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



16. Install the drive pinion seal and flange. For additional information, refer to Drive Pinion Flange and Drive Pinion Seal in this section.

17. Install the differential carrier. For additional information, refer to Differential Carrier in this section.

18.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

Repower the system.














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SECTION 205-02: Rear Drive Axle/Differential - Ford  
8.8-Inch Ring Gear  
IN-VEHICLE REPAIR

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

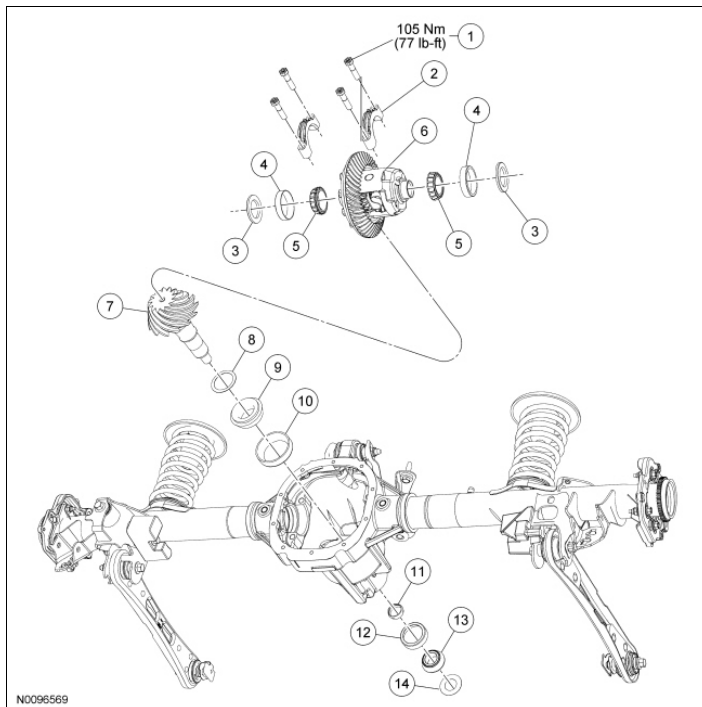
## Differential Bearings

### Special Tool(s)

 ST2025-A	2 Jaw Puller 205-D072 (D79L-4221-A1) or equivalent
 ST1743-A	Adapter for 205-S127 205-105 (T76P-4020-A3)
 ST1429-A	Adapter for 205-S127 205-109 (T76P-4020-A9)
 ST1431-A	Adapter for 205-S127 205-110 (T76P-4020-A10)
 ST1432-A	Adapter for 205-S127 205-111 (T76P-4020-A11)
 ST1743-A	Adapter for 205-S127 205-129 (T79P-4020-A18)
 ST1434-A	Adapter for 205-S127 205-130 (T79P-4020-A19)
 ST1375-A	Installer, Differential Side Bearing 205-010 (T57L-4221-A2)
 ST1367-A	Installer, Drive Pinion Bearing Cone 205-005 (T53T-4621-C)
 ST1678-A	Installer, Drive Pinion Bearing Cup 205-024 (T67P-4616-A)
 ST1254-A	Plate, Bearing/Oil Seal 205-090 (T75L-1165-B)
 ST1744-A	Protector, Drive Pinion Thread 205-460 or equivalent
 ST1368-A	Puller, Bearing 205-D064 (D84L-1123-A) or equivalent



Step Plate  
205-D016 (D80L-630-5) or equivalent



Item	Part Number	Description
1	-	Differential bearing cap bolt (part of 4010)
2	-	Differential bearing cap (part of 4010)
3	4067	Differential bearing shims (2 required)
4	4222	Differential bearing cups (2 required)
5	4221	Differential bearings (2 required)
6	4204	Differential assembly
7	4209	Drive pinion
8	4663	Pinion bearing adjustment shim
9	4630	Inner pinion bearing
10	4628	Inner pinion bearing cup
11	4662	Collapsible spacer
12	4616	Outer pinion bearing cup
13	4621	Outer pinion bearing
14	4670	Pinion oil slinger

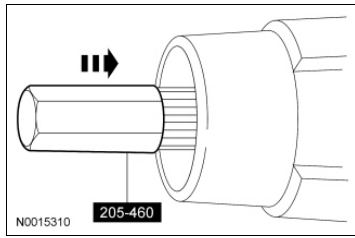
### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

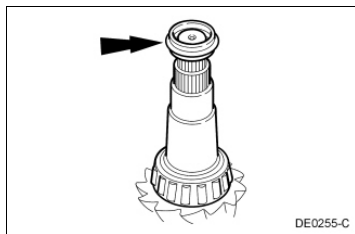
Remove the drive pinion seal. For additional information, refer to [Drive Pinion Flange and Drive Pinion Seal](#) in this section.

2. Remove the differential carrier. For additional information, refer to [Differential Carrier](#) in this section.

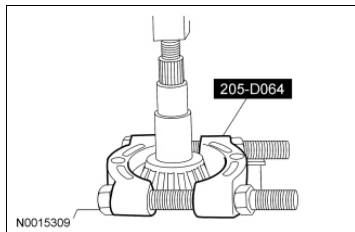
3. Remove the axle drive pinion shaft oil slinger.
4. Using the Drive Pinion Thread Protector and a soft-faced hammer, drive the pinion assembly out of the outer pinion bearing and remove it through the rear of the differential housing.



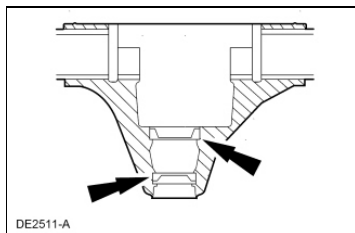
5. Remove the outer pinion bearing.
6. Remove the drive pinion collapsible spacer and discard it.



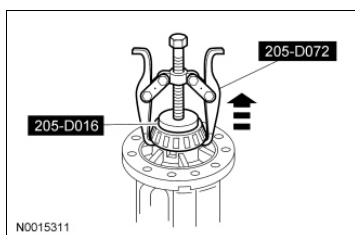
7. Using the Bearing Puller and a suitable press, remove the inner pinion bearing.



8. Using a brass drift, remove the pinion bearing cups by tapping alternately on opposite sides of the bearing cups.



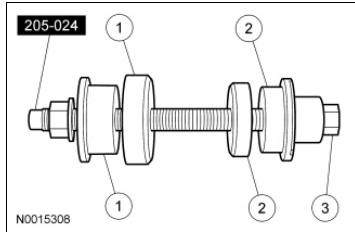
9. Using the 2 Jaw Puller and Step Plate, remove the 2 differential bearings.



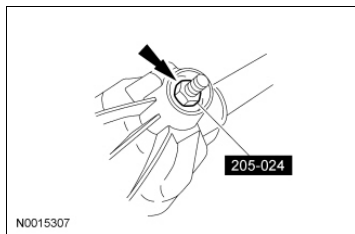
## Installation

### Differential Bearings

1. Position the Drive Pinion Bearing Cup Installer and the new inner and outer drive pinion bearing cups in their respective bores.
  1. After placing the inner and outer drive pinion bearing cups in their bores, place the Drive Pinion Bearing Cup Installer (inner) on the inner drive pinion bearing cup.
  2. Place the Drive Pinion Bearing Cup Installer (outer) on the outer drive pinion bearing cup.
  3. Install the Drive Pinion Bearing Cup Installer threaded rod.

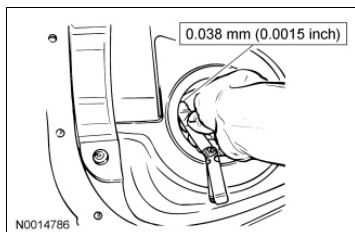


2. Tighten the Drive Pinion Bearing Cup Installer to seat the drive pinion bearing cups into their bores.



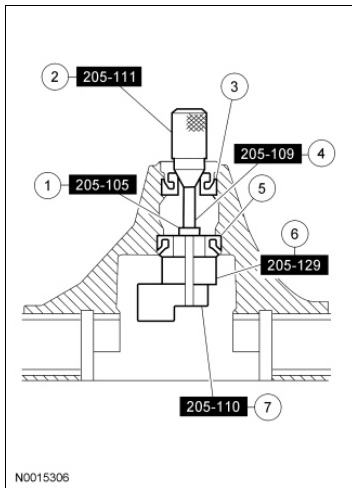
3. **NOTE:** If a feeler gauge can be inserted between a drive pinion bearing cup and the bottom of its bore at any point around the drive pinion bearing cup, the drive pinion bearing cup is not correctly seated.

Make sure the drive pinion bearing cups are correctly seated in their bores.



4. **NOTE:** Install new drive pinion bearings without any additional lubricant since the anti-rust oil provides adequate lubricant without upsetting the drive pinion bearing preload settings.

Assemble and position the Adapters for 205-S127.

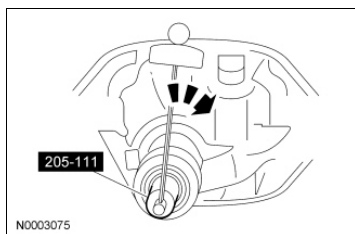


Item	Part Number	Description
1	205-105	Adapter for 205-S127 (1.612 inch OD) (T76P-4020-A3)
2	205-111	Adapter for 205-S127 (T76P-4020-A11)
3	4621	Drive pinion bearing (outer)
4	205-109	Adapter for 205-S127 (T76P-4020-A9)
5	4630	Drive pinion bearing (inner)
6	205-129	Adapter for 105-S127 (1.1884 inch thick) (T79P-4020-A18)
7	205-110	Adapter for 205-S127 (1.7 inch thick) (T76P-4020-A10)

5. **NOTE:** This step duplicates final drive pinion bearing preload.

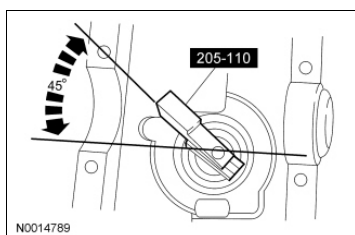
Tighten the Adapter.

- Tighten to 2.2 Nm (20 lb-in).



6. **NOTE:** The Adapter must be offset to obtain an accurate reading.

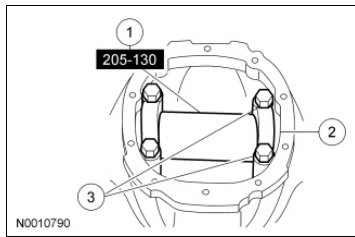
Rotate the Adapter several half-turns to make sure of correct seating of the drive pinion bearings.





7. Install the Adapter.

1. Position the Adapter.
  2. Install the 2 differential bearing caps.
  3. Install the 4 differential bearing cap bolts.
- ◆ Tighten to 105 Nm (77 lb-ft).

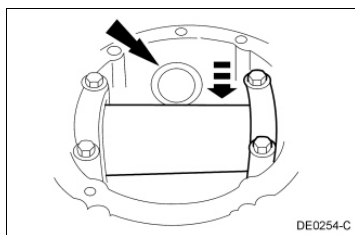


8. **NOTE:** Drive pinion bearing adjustment shims must be flat and clean.

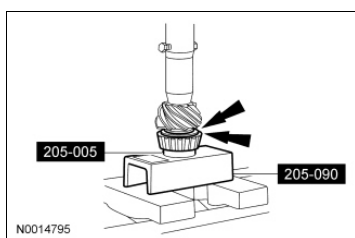
**NOTE:** A slight drag should be felt for correct drive pinion bearing adjustment shim selection. Do not attempt to force the drive pinion bearing adjustment shim between the gauge block and the Adapter. This will minimize selection of a drive pinion bearing adjustment shim thicker than required, which results in a deep tooth contact in final assembly of integral axle assemblies.

Use a drive pinion bearing adjustment shim as a gauge for drive pinion bearing adjustment shim selection.

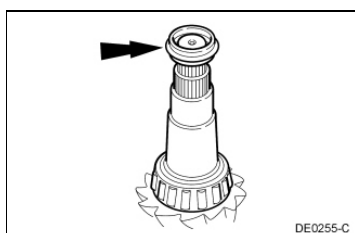
- After the correct drive pinion bearing adjustment shim thickness has been determined, remove all of the Adapters.



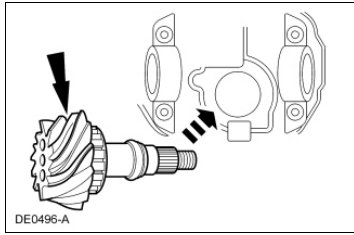
9. Using the Drive Pinion Bearing Cone Installer and Bearing/Oil Seal Plate, press the inner drive pinion bearing and drive pinion bearing adjustment shim until it is firmly seated on the pinion shaft.



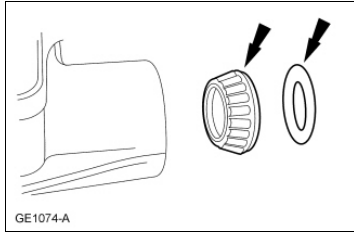
10. Install a new drive pinion collapsible spacer on the pinion shaft against the pinion shaft shoulder.



11. Position the drive pinion assembly into the axle housing.

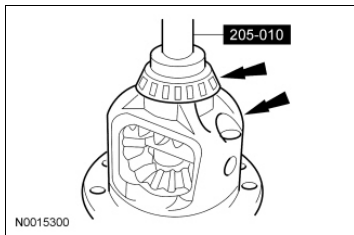


12. Install the outer drive pinion bearing and the drive pinion shaft oil slinger.



13. Install the drive pinion seal and flange. For additional information, refer to Drive Pinion Flange and Drive Pinion Seal in this section.

14. Using the Differential Side Bearing Installer, install the 2 new differential bearings.



15. Install the differential carrier. For additional information, refer to Differential Carrier in this section.

16. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

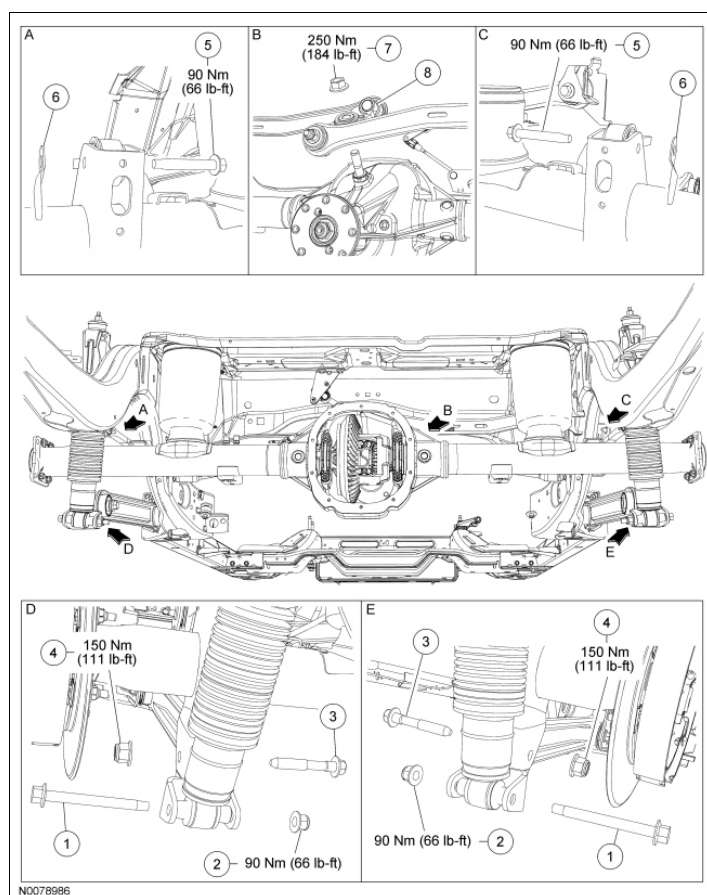
Repower the system.



SECTION 205-02: Rear Drive Axle/Differential - Ford  
 8.8-Inch Ring Gear  
 REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

## Axle Assembly



Item	Part Number	Description
1	W506551	Shock lower bolts (2 required)
2	W520214	Shock lower nuts (2 required)
3	W704665	Lower arm-to-axle bolts (2 required)
4	W520215	Lower arm-to-axle flagnuts (2 required)
5	W506545	Upper arm-to-axle bolts (2 required)
6	W704662	Upper arm-to-axle flagnuts (2 required)
7	W520517	Watts link pivot nut
8	4264	Watts link pivot

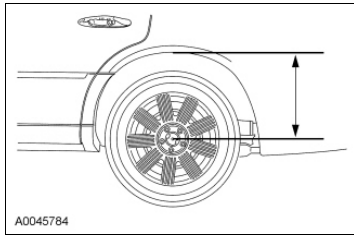
### Removal

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

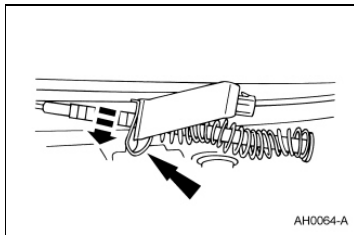
**NOTICE:** Suspension fasteners are critical parts because they affect performance of vital components and systems and their failure may result in major service expense. New fasteners must be installed with the same part number or an equivalent part if installation is necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to make sure of correct retention of these parts. Orientation of the fasteners is also important on all rear

**suspension arms. Make sure the fasteners are installed in the same direction as they were in when removed.**

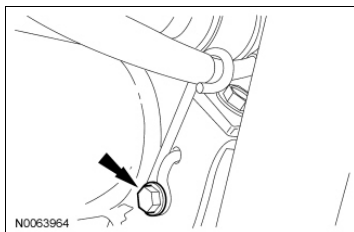
1. For reference during the installation procedure, measure the distance from the lip of the fender to the center of the wheel hub with the vehicle in a static level ground position.



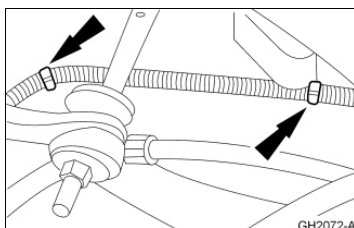
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#) .
3. Remove the 2 brake caliper anchor plates. For additional information, refer to [Section 206-04](#) .
4. Remove the rear stabilizer bar and links. For additional information, refer to [Section 204-02](#) .
5. Remove the parking brake rear cable and conduit from the parking brake cable retainers.
  - Reroute the parking brake rear cable and conduit aside.
6. Disconnect the RH and LH parking brake cables from the axle housing.



7. Remove the 2 RH parking brake cable wireform bracket bolts.

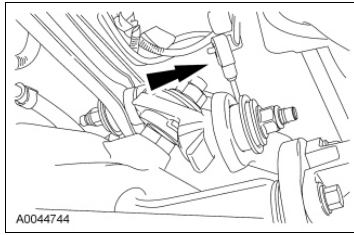


8. Disconnect the RH and LH parking brake cables from the parking brake cable extension unions.
9. Disconnect the wheel speed sensor harness routing clips.



10. Remove the 2 wheel speed sensor bolts and position aside the sensors.

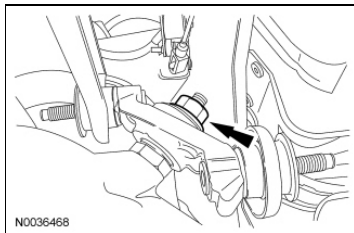
11. Detach the air suspension height sensor link.



12. **NOTICE:** Take care not to damage the threads on the pivot stud.

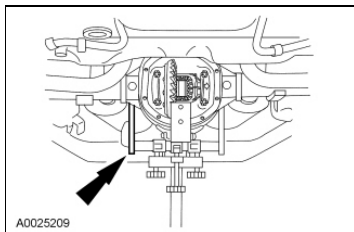
Separate the Watts linkage from the rear axle housing.

- Remove and discard the nut from the pivot stud.



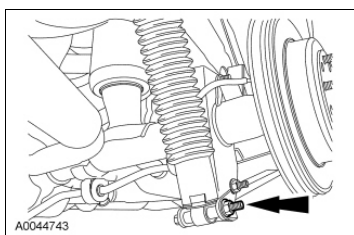
13. **NOTICE:** Use additional support straps to secure the rear axle to the jack or damage to the component may occur.

Support the rear axle housing with a suitable jack.

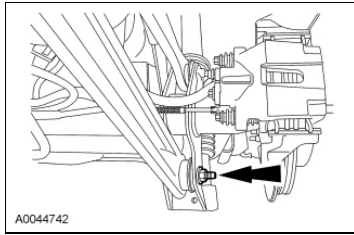


14. **⚠ WARNING:** Do not apply heat or flame to the shock absorber or strut tube. The shock absorber and strut tube are gas pressurized and could explode if heated. Failure to follow this instruction may result in serious personal injury.

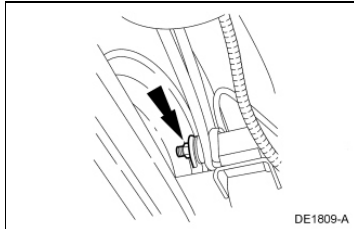
Remove and discard the 2 shock absorber lower nuts, then remove the shock absorbers from the retainer brackets.



15. Remove and discard the 2 nuts and 2 bolts retaining the LH and RH lower control arms.



16. Remove and discard the 2 nuts and 2 bolts retaining the LH and RH upper control arms.



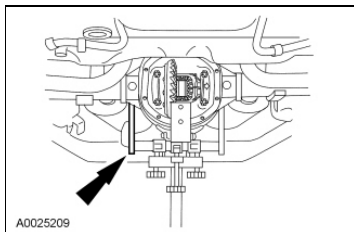
17. Unseat the air springs and lower the rear axle from the vehicle.

## Installation

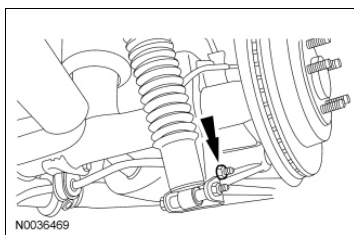
1. **NOTICE:** Use additional support straps to secure the rear axle to the jack or damage to the component may occur.

Raise the rear axle into position, using a suitable transmission jack.

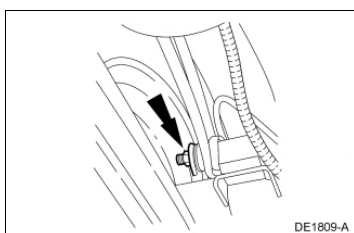
- Seat the air springs.



2. Loosely install the 2 new lower control arm bolts and 2 nuts.

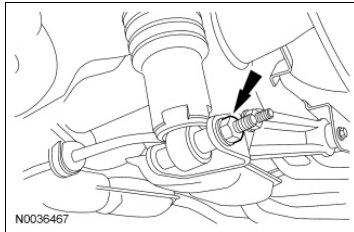


3. Loosely install the 2 new upper control arm bolts and 2 nuts.



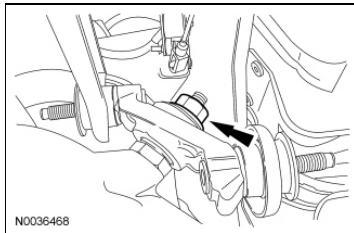
4. Install the shock absorbers.

- Position the shock absorbers into the retainer brackets, and tighten the 2 new nuts and bolts.
- ♦ Tighten to 90 Nm (66 lb-ft).

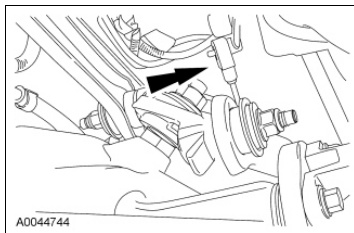


5. Position the Watts linkage on the rear axle housing.

- Loosely install the new nut on the pivot stud.

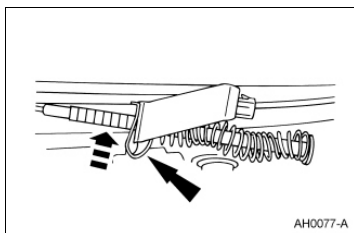


6. Attach the air suspension height sensor link.



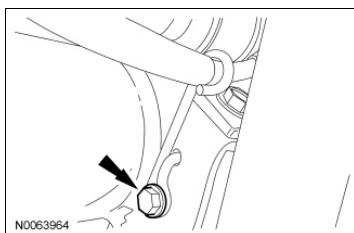
7. Position the parking brake rear cable and conduit in the parking brake cable retainers.

8. Connect the parking brake cable to the axle housing.



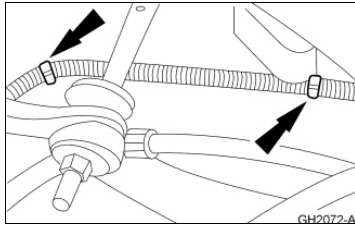
9. Install the parking brake cable and conduit bolts.

- Tighten to 17 Nm (150 lb-in).

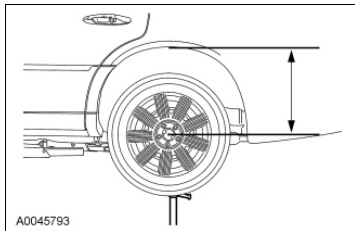


10. Connect the wheel speed sensor harness routing clips.





11. Install the 2 wheel speed sensors and the bolts.
  - Tighten to 7 Nm (62 lb-in).
12. Install the rear stabilizer bar. For additional information, refer to [Section 204-02](#) .
13. Install the driveshaft. For additional information, refer to [Section 205-01](#) .
14. Install the 2 brake caliper anchor plates. For additional information, refer to [Section 206-04](#) .
15. Before tightening the fasteners, use a suitable jack to raise the suspension until the distance between the lip of the fender and the center of the wheel hub is equal to the measurement taken in the removal procedure.



16. Tighten the 2 new lower control arm bolts and 2 nuts to 150 Nm (111 lb-ft).
17. Tighten the 2 new upper control arm bolts and 2 nuts to 90 Nm (66 lb-ft).
18. Tighten the new nut on the pivot stud to 250 Nm (184 lb-ft).
19. Adjust the parking brake cable tension. For additional information, refer to Parking Brake Cable Adjustment in [Section 206-05](#) .
20. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

Repower the system.




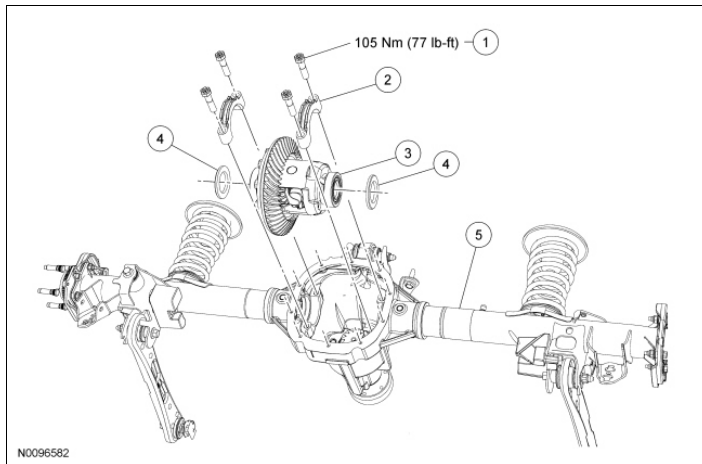
SECTION 205-02: Rear Drive Axle/Differential - Ford  
 8.8-Inch Ring Gear  
 REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

## Differential Carrier

### Special Tool(s)

 ST1485-A	Installer, Differential Shim 205-220 (T851-4067-AH)
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Item	Part Number	Description
1	-	Differential bearing cap bolt (4 required)
2	-	Differential bearing cap (2 required)
3	4204	Differential assembly
4	4067	Differential bearing shims (2 required)
5	4010	Axle housing

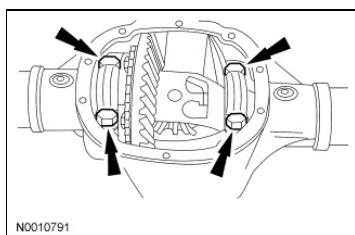
### Removal

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Remove the axle shafts. For additional information, refer to [Axle Shaft](#) in this section.

- NOTE:** Index-mark the position of the differential bearing caps, as arrows may not be visible. The differential bearing caps must be installed in their original locations and positions.

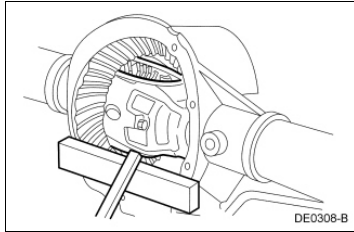
Remove the 4 differential bearing cap bolts and the 2 differential bearing caps.



3. **NOTE:** Place a wood block between the pry bar and the axle housing to protect the machined surface from damage.

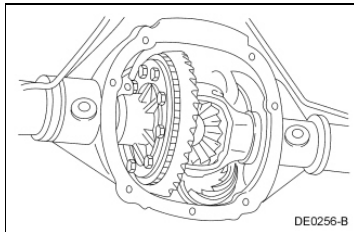
**NOTE:** Index-mark the position of the differential bearing shims. The differential bearing shims must be installed in their original locations and positions.

Using pry bars and wood blocks, remove the differential carrier assembly from the axle housing.

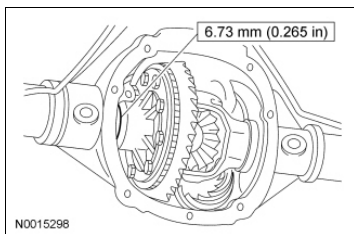


## Installation

1. Position the differential assembly in the axle housing.

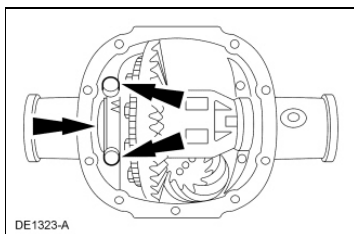


2. Install the originally removed differential bearing shim on the LH side.

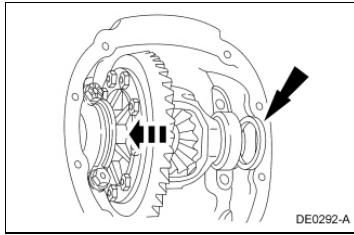


3. **NOTE:** Apply pressure toward the LH side to make sure the LH differential bearing cap is seated.

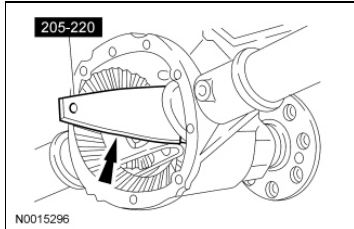
Install the LH differential bearing cap and loosely install the 2 differential bearing cap bolts.



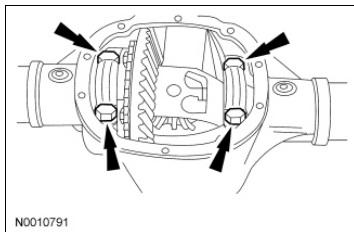
4. Install the original differential bearing shim on the RH side.



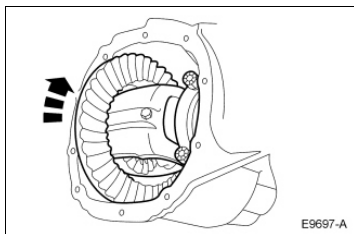
5. Using the Differential Shim Installer, fully seat the differential bearing shims.



6. Install the RH side differential bearing cap and tighten the 4 differential bearing cap bolts.
- Tighten to 105 Nm (77 lb-ft).



7. Rotate the differential assembly to make sure it rotates freely.



8. Adjust the ring gear backlash. For additional information, refer to Ring Gear Backlash Adjustment in this section.
9. Install the axle shafts. For additional information, refer to Axle Shaft in this section.
10. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

Repower the system.









SECTION 205-02: Rear Drive Axle/Differential - Ford  
 8.8-Inch Ring Gear  
 DISASSEMBLY AND ASSEMBLY

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

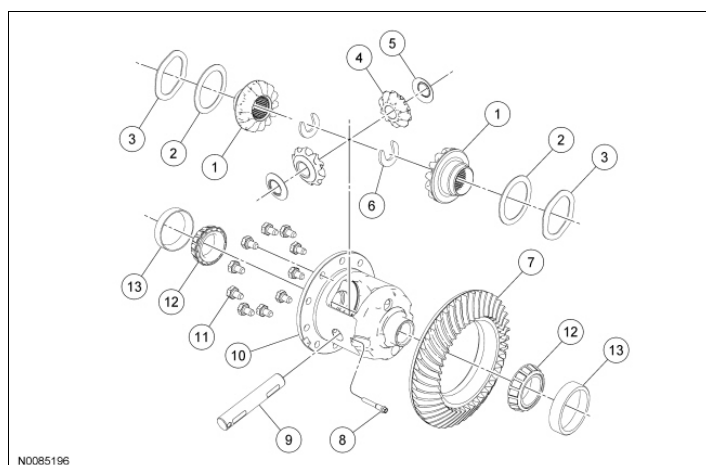
## Differential Case and Ring Gear - Conventional

### Special Tool(s)

 ST1214-A	Dial Indicator Gauge With Holding Fixture 100-002 (TOOL-4201-C)
 ST1957-A	Gauge, Differential (Traction-Lock) 205-384 (T97T-4205-A)
 ST1749-A	Gauge, Differential (Traction Lock) 205-386 (T97T-4205-D)
 ST1375-A	Installer, Differential Side Bearing 205-010 (T57L-4221-A2)
 ST1220-A	Remover, Differential Bearing 205-116 (T77F-4220-B1)
 ST1543-A	Step Plate 205-D016 (D80L-630-5) or equivalent

### Material

Item	Specification
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B
Threadlock and Sealer TA-25	WSK-M2G351-A5



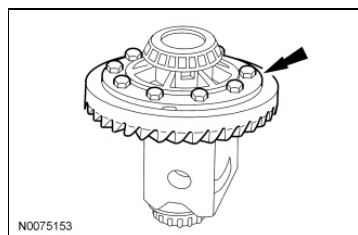
Item	Part Number	Description
1	4236	Differential side gears
2	4228	Differential side gear thrust washers
3	-	Differential side gear wave washers
4	4215	Differential pinion gear (2 required)
5	4230	Differential pinion thrust washer (2 required)
6	4N237	Axle shaft U-washer (2 required)
7	4209	Differential ring gear
8	4241	Differential pinion shaft lock bolt
9	4211	Differential pinion shaft
10	4204	Differential case
11	4216	Differential ring gear bolt (10 required)
12	4221	Differential bearings
13	4222	Differential bearing cups

### Initial disassembly

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

**NOTE:** If the differential ring gear backlash between teeth is greater than specification, remove the ring gear to check the differential case flange runout. Do not disassemble the differential carrier assembly.

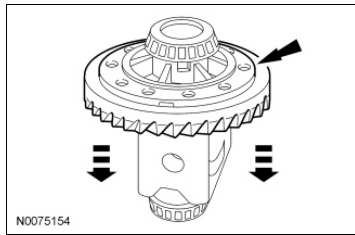
1. Remove the differential carrier. Tag the differential shims and bearing cups for location. For additional information, refer to **Differential Carrier** in this section.
2. Remove and discard the 10 differential ring gear bolts.



3. **NOTICE:** Care should be taken not to damage the differential ring gear bolt hole threads.



Insert a punch in the differential ring gear bolt holes and drive the differential ring gear off.

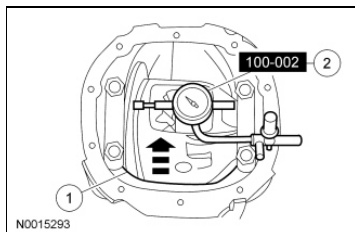


4. If checking differential case flange runout, install the bearing cups in their original location and install the differential assembly.

1. Install the bearing caps and differential shims.

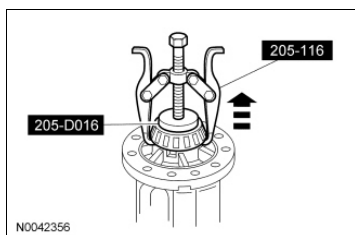
♦ Rotate the differential assembly to verify the bearings have seated.

2. Install the Dial Indicator Gauge With Holding Fixture and record the differential case runout.

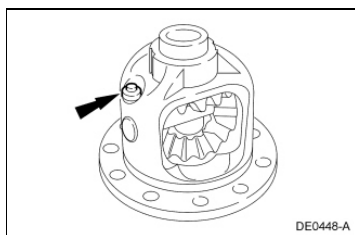


### Final disassembly

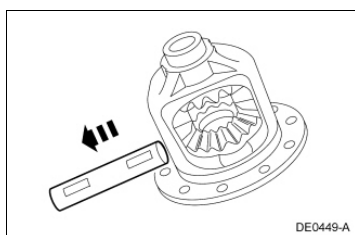
5. Using the Differential Bearing Remover and Step Plate, remove the differential bearings.



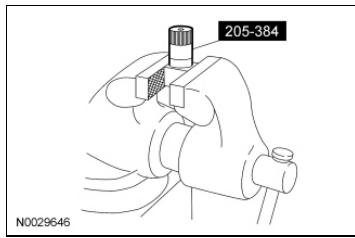
6. Remove the differential pinion shaft lock bolt.



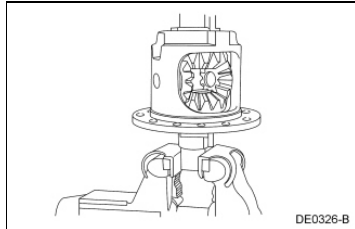
7. Remove the differential pinion shaft.



8. Install the Differential Gauge in a suitable vise.

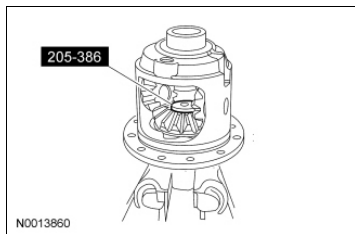


9. Install the differential case on the Differential Gauge.

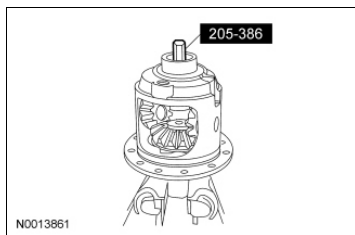


10. **NOTE:** Apply a small amount of grease to the centering hole of the Differential Gauge.

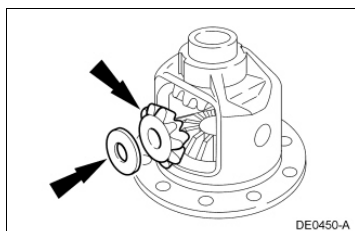
Install the Differential Gauge step plate in the bottom differential side gear.



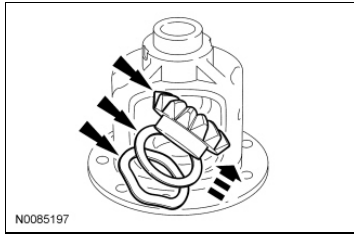
11. Install the Differential Gauge nut in the upper differential side gear. Hold the nut in position while installing the Differential Gauge hex screw. Tighten the hex-head screw until contact is made with the Step Plate.



12. Rotate and remove the differential pinion gears and differential pinion gear thrust washers.



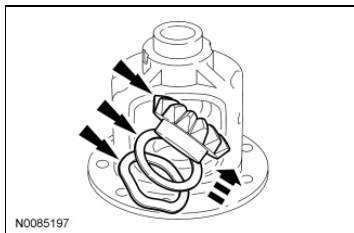
13. Remove the differential side gears, the differential side gear washers and the differential side gear wave washers.



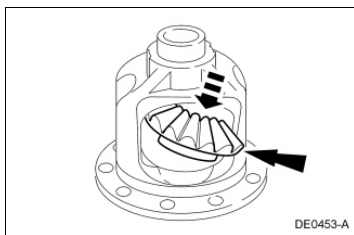
## Assembly

1. **NOTE:** Lubricate the differential side gear thrust washers, wave washers and the side gear journals with axle lubricant.

Position the differential side gear thrust washers and wave washers on the differential side gears.



2. Install the differential side gears.

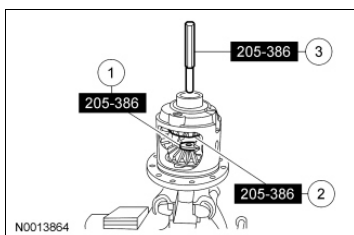


3. **NOTE:** Apply a small amount of grease to the Step Plate bore.

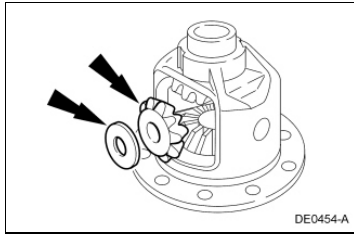
**NOTE:** If necessary, insert the Differential Gauge dowel bar in the nut bore to keep the nut from turning as the hex screw is tightened.

Assembly the Differential Gauge to the differential case.

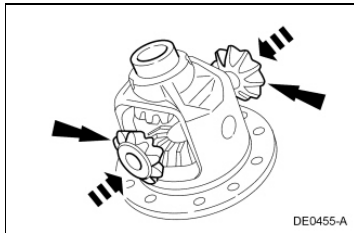
1. Position the Differential Gauge step plate in the bottom differential side gear.
2. Position the Differential Gauge hex screw plate in the top differential side gear and hold it in place.
3. Install the Differential Gauge hex screw and tighten it 2 turns after it contacts the bottom Step Plate.



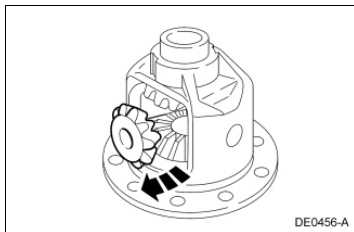
4. Use axle lubricant to lubricate the differential pinion gear thrust washers and the differential pinion gears.



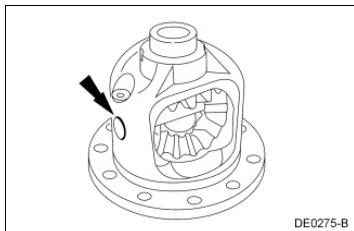
5. Install the differential pinion gears and differential pinion gear thrust washers opposite the differential side gears.



6. Rotate the differential pinion gears to align with the differential pinion shaft bore.

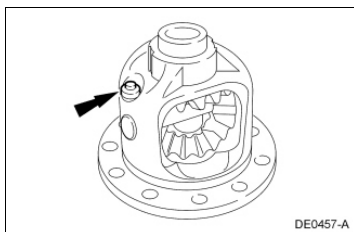


7. Install the differential pinion shaft.
- Align the hole in the differential pinion shaft with the hole in the differential case.

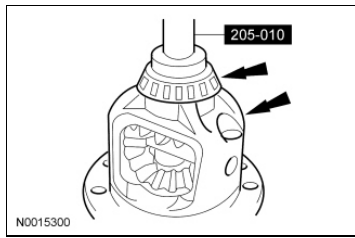


8. **NOTE:** If a new pinion shaft lock bolt is unavailable, coat the threads with threadlock and sealer prior to installation.

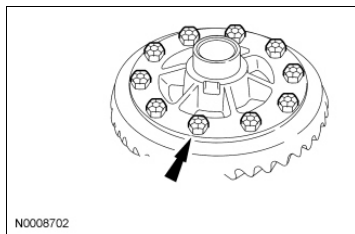
Install a new differential pinion shaft lock bolt and tighten finger-tight.



9. Using the Differential Side Bearing Installer, install the new differential bearings on the differential case.



10. Position the differential ring gear on the differential case. Align the bolt holes by starting 2 bolts through the holes in the differential case and into the differential ring gear.
11. Using a shop press, press the ring gear on the differential case.
12. Install the 10 new differential ring gear bolts. Tighten in 2 stages.
  - Stage 1: Tighten to 60 Nm (44 lb-ft).
  - Stage 2: Tighten an additional 90 degrees.



13. Install the differential carrier. For additional information, refer to Differential Carrier in this section.
14. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Repower the system.











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SECTION 205-02: Rear Drive Axle/Differential - Ford  
8.8-Inch Ring Gear  
DISASSEMBLY AND ASSEMBLY

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 01/28/2011

## Differential Case and Ring Gear - Traction-Lok

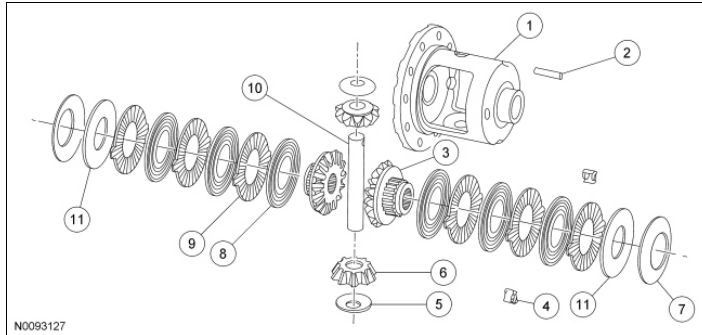
### Special Tool(s)

 ST1214-A	Dial Indicator Gauge With Holding Fixture 100-002 (TOOL-4201-C)
 ST1374-A	Gauge, Differential Clutch 205-135 (T80P-4946-A)
 ST1265-A	Gauge, Differential Clutch 205-022 (T66L-4204-A)
 ST1372-A	Gauge, Differential Clutch (Mandrel for 205-135 [T80P-4946-A]) 205-270 (T87T-4946A)
 ST1857-A	Gauge, Differential (Traction-Lock) 205-384 (T97T-4205-A)
 ST1748-A	Gauge, Differential (Traction-Lock) 205-386 (T97T-4205-D)
 ST1375-A	Installer, Differential Side Bearing 205-010 (T57L-4221-A2)
 ST1220-A	Remover, Differential Bearing 205-116 (T77F-4220-B1)
 ST1858-A	Rotator, Differential 205-378 (T97T-4205-C)
 ST1543-A	Step Plate 205-D016 (D80L-630-5) or equivalent

### Material

Item	Specification
Additive Friction Modifier XL-3 (US); CXL-3 (Canada)	EST-M2C118-A
Motorcraft® SAE 75W-140 Synthetic Rear Axle Lubricant XY-75W140-QL (US); CXY-75W140-1L (Canada)	WSL-M2C192-A and GL-5

Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B
Threadlock and Sealer TA-25	WSK-M2G351-A5



Item	Part Number	Description
1	4204	Differential case
2	4241	Differential pinion shaft lock bolt
3	4236	Differential side gear
4	-	Retainer clip (part of 4880)
5	4230	Differential pinion thrust washer
6	4215	Differential pinion gear
7	-	Plate preload spacer (part of 4880)
8	-	Clutch disc (part of 4880)
9	-	Clutch plate (part of 4880)
10	4211	Differential pinion shaft
11	-	Selective shims (part of 4880)

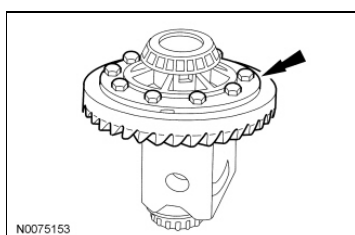
#### Initial disassembly

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

**NOTE:** If the Diagnostic Chart directed the servicing of the Traction-Lok clutch packs, it is not necessary to remove the differential carrier assembly from the axle housing. Proceed to Step 7.

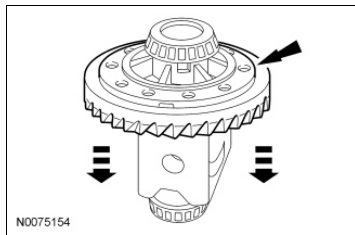
**NOTE:** If the differential ring gear backlash between teeth is greater than specification, remove the ring gear to check the differential case flange runout. Do not disassemble the differential carrier assembly.

1. Remove the differential carrier. Tag the differential shims and bearing cups for location. For additional information, refer to **Differential Carrier** in this section.
2. Remove and discard the 10 differential ring gear bolts.



**3. NOTICE: Care should be taken not to damage the differential ring gear bolt hole threads.**

Insert a punch in the differential ring gear bolt holes and drive the differential ring gear off.

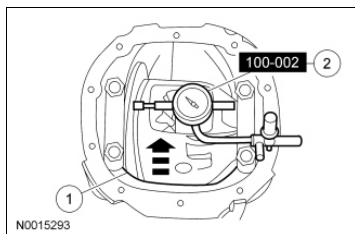


**4. If checking differential case flange runout, install the bearing cups in their original location and install the differential assembly.**

1. Install the bearing caps and differential shims.

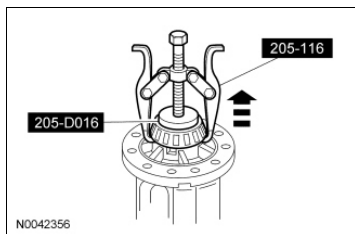
◆ Rotate the differential assembly to verify the bearings have seated.

2. Install the Dial Indicator Gauge With Holding Fixture and record the differential case runout.

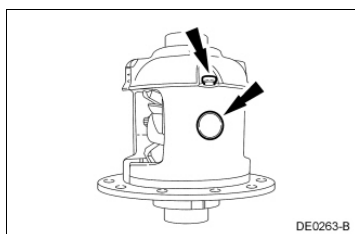


**Final disassembly**

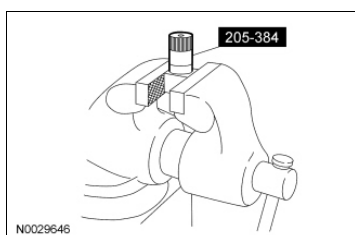
**5. Using the Differential Bearing Remover and Step Plate, remove the differential bearings.**



**6. Remove the differential pinion shaft lock bolt and remove the differential pinion shaft.**

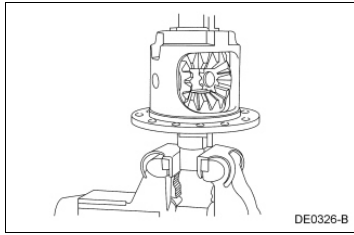


**7. Install the Differential Gauge in a suitable vise.**



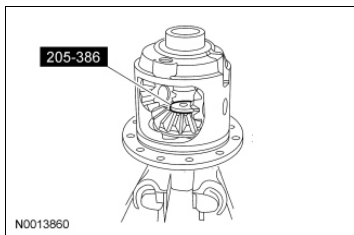


8. Install the differential case on the Differential Gauge.

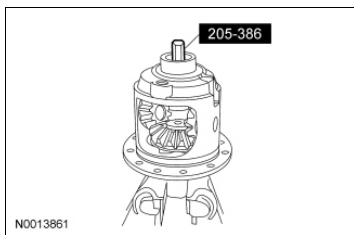


9. **NOTE:** Apply a small amount of grease to the centering hole of the Differential Gauge.

Install the Differential Gauge step plate in the bottom differential side gear.

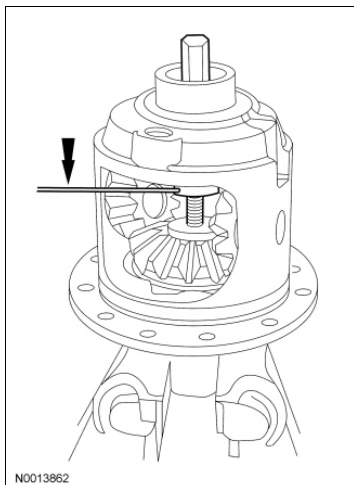


10. Install the nut in the upper differential side gear. Hold the nut in position while installing the hex screw. Tighten the hex-head screw until contact is made with the Differential Gauge step plate.



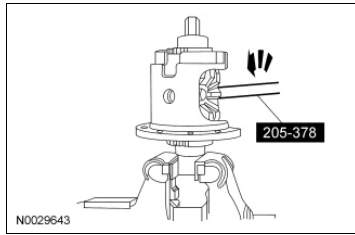
11. **NOTE:** The dowel bar is used to keep the nut from turning when the forcing screw is tightened.

Insert a suitable dowel bar in the hole of the nut. Tighten the forcing screw to force the differential side gears away from the differential pinion gears.

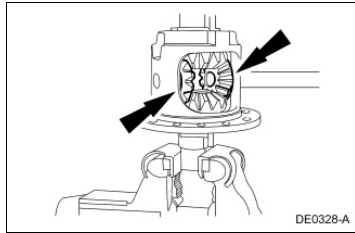


12. **NOTE:** Differential pinion gear thrust washers cannot be removed independently of the differential pinion gears.

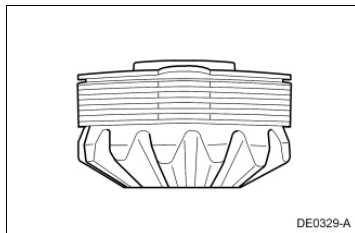
Insert the Differential Rotator in the pinion shaft bore, and turn the differential case to "walk" the differential pinion gears and differential case windows.



13. Remove the differential pinion gears and differential pinion gear thrust washers.



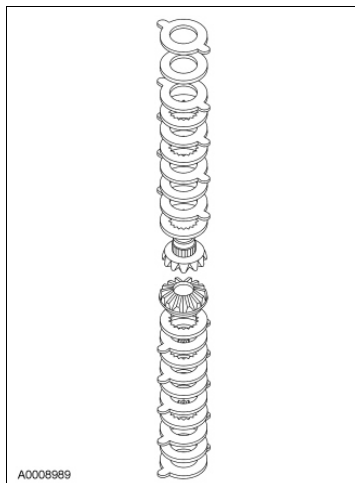
14. Remove the differential side gears and differential clutch packs with the selective shim and Belleville spring, tag them RH and LH.



15. **NOTICE:** Do not use acids or solvents when cleaning the differential clutch pack or damage to the components can result. Wipe components with a clean, lint-free cloth only.

**NOTE:** When separating the clutch plates and clutch disc, note the sequence in which they are disassembled. They must be reassembled in the same sequence.

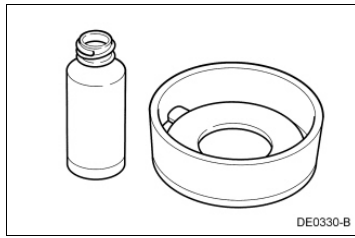
Separate the differential clutch disc and clutch plates for cleaning and inspection.



## Assembly

1. **NOTE:** Use 118 ml (4 oz) of the specified friction modifier in the axle.

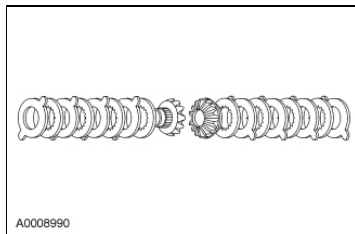
Pre-lubricate each steel clutch plate and soak all friction plates with friction modifier for at least 15 minutes.



2. **NOTE:** Do not mix the differential clutch packs or selective shims from one side with the other.

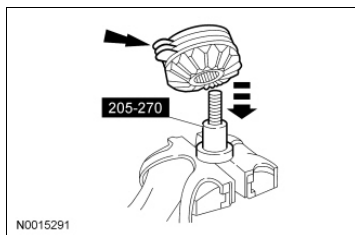
**NOTE:** The Belleville spring is a dished plate.

Assemble the differential clutch packs (without the selective shims and Belleville spring) on the respective differential side gears.

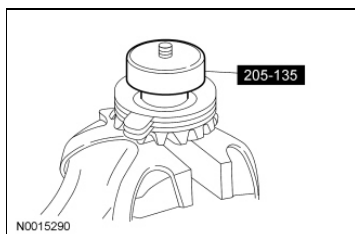


3. **NOTE:** Make sure the correct mandrel is used with the Differential Clutch Gauge.

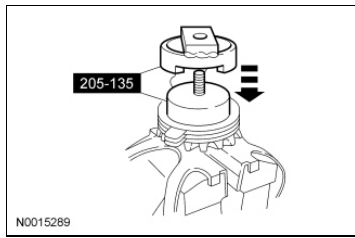
Place the base portion of the Differential Clutch Gauge in a vise. Install the differential clutch pack and differential side gear (without the selective shim or Belleville spring) on the gauge.



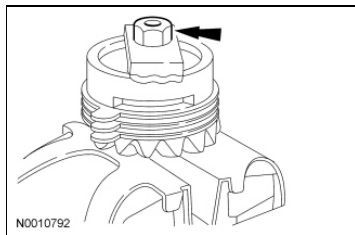
4. Position the Differential Clutch Gauge hand-tight on top of the differential clutch pack.



5. Install the Differential Clutch Gauge over the disc and differential clutch pack.



6. Install the nut of the gauge over the top and base stud.
  - Tighten to 7 Nm (62 lb-in).

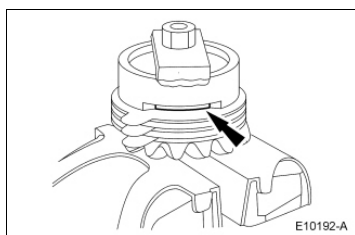


7. **NOTE:** Selective shims shown are available as part of the Clutch Pack Replacement Kit.

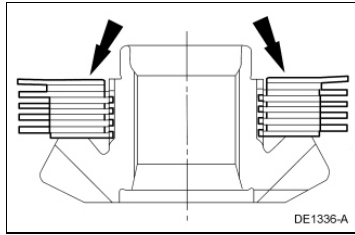
Use the feeler gauge and select the thickest blade that will enter between the tool and the differential clutch pack. Refer to the chart to determine which shim to use.

#### Selective Shims

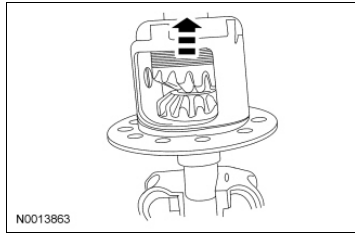
Feeler Gauge	Part Number	Description
0.096-0.104	E0AZ-4A324-G	0.025 in
0.105-0.109	E0AZ-4A324-H	0.030 in
0.110-0.114	E0AZ-4A324-C	0.035 in
0.115-0.190	E0AZ-4A324-D	0.040 in
0.120-0.125	E0AZ-4A324-F	0.045 in



8. Remove the Differential Clutch Gauge from the clutch pack and differential side gear assembly.
9. Place the selective shim and Belleville spring on the differential clutch pack.
  - The dished or concave side of the Belleville spring must face up against the thrust face of the differential case.



10. Install the differential side gears with the differential clutch packs, selective shims and Belleville spring into the differential case.
- Hold the differential side gear assembly in place to prevent it from falling out of the differential case.

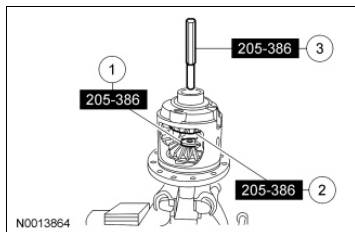


11. **NOTE:** Apply a small amount of grease to the step plate bore.

**NOTE:** If necessary, insert the dowel bar in the nut bore to keep the nut from turning as the hex screw is tightened.

Assemble the Differential Gauge to the differential case.

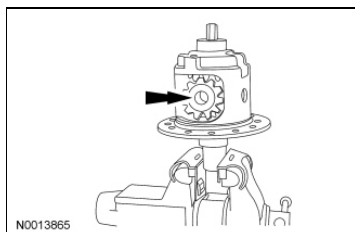
1. Position the Differential Gauge step plate in the bottom differential side gear.
2. Position the Differential Gauge in the top differential side gear and hold it in place.
3. Install the Differential Gauge and tighten it 2 turns after it contacts the bottom step plate.



12. **NOTE:** Lubricate both sides of the differential pinion gear thrust washers with axle lubricant.

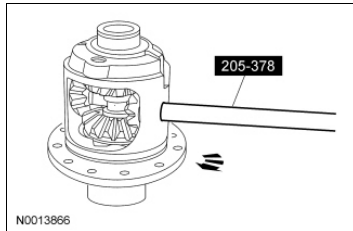
**NOTE:** Make sure the differential pinion gears are 180 degrees apart so they will align correctly with the pinion shaft bore.

Position the differential pinion gears and differential pinion gear thrust washers in the window of the differential case so they mesh with the differential side gear teeth.



13. **NOTE:** It will probably be necessary to loosen or tighten the forcing screw to allow the differential pinion gears and differential side gears to rotate.

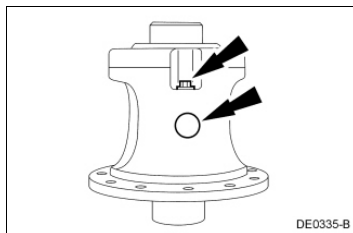
Inspect the Differential Rotator into the pinion shaft bore, and turn the differential case. This will cause the differential pinion gears to engage the differential side gear and "walk" into the differential case. Rotate the differential case until the pinion shaft mating holes are lined up exactly with the holes in the differential pinion gears.



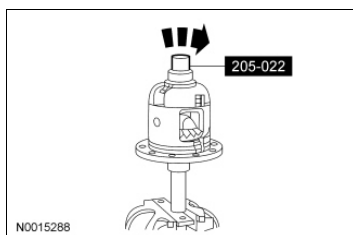
14. Remove the special tools.

15. **NOTE:** If a new differential pinion shaft lock bolt is unavailable, coat the threads of the original differential pinion shaft lock bolt with threadlock prior to installation.

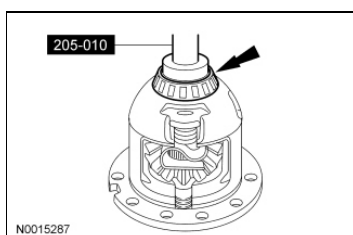
Install the differential pinion shaft, then a new differential pinion shaft lock bolt finger-tight.



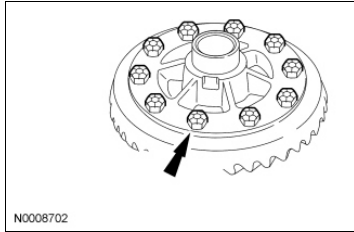
16. Check the torque required to rotate one differential side gear.
- Mount the differential assembly and Differential Clutch Gauge in a vise.
  - The initial minimum break-away torque, if original clutch plates are used, must be within specification. The minimum rotating torque required to keep the differential side gear turning with new clutch plates may vary.



17. Using the Differential Side Bearing Installer, install the 2 differential bearings on the differential case.



18. Position the differential ring gear, the new anti-lock speed sensor ring and the differential case. Align the bolt holes by hand-starting 2 new bolts through the holes in the differential case and into the differential ring gear.
19. Hand-start the 8 remaining new differential ring gear bolts. Tighten the 10 bolts in 2 stages.
  - Stage 1: Tighten to 60 Nm (44 lb-ft).
  - Stage 2: Tighten an additional 90 degrees.



20. Install the differential carrier. For additional information, refer to Differential Carrier in this section.
21. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Repower the system.

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## SECTION 206-00: Brake System - General Information

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## SPECIFICATIONS

Procedure revision date: 08/19/2009

## Material

Item	Specification	Fill Capacity
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	780 ml (1.64 pt)
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-

## General Specifications

Item	Specification
<b>Brake Disc</b>	
Front brake disc minimum thickness	26.35 mm (1.037 in)
Rear brake disc minimum thickness	18.0 mm (0.708 in)
<b>Brake Pads</b>	
Maximum brake pad taper wear (in any direction)	3.0 mm (0.118 in)
Minimum brake pad thickness	3.0 mm (0.118 in)

## Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper bleeder screw	21	15	-
Master cylinder bleeder screw	13	-	115
Master cylinder brake outlet tube fittings	17	-	150





## Brake System

The brake system consists of the following components:

- Front and rear disc brakes
- Cable/drum-in-hat actuated parking brake
- Brake master cylinder and fluid reservoir
- Vacuum-assisted power brake booster
- Four-wheel ABS
- Red brake warning indicator

The brake pedal is connected to the power brake booster, which is connected to the brake master cylinder. When the brake pedal is pressed, brake fluid is pushed through the double-walled steel tubes and flexible hoses to the front and rear disc brake calipers. The brake fluid enters the disc brake calipers, forcing the caliper pistons and brake pads outward against the brake disc friction surface, slowing or stopping rotation. When the brake pedal is released, brake fluid pressure is relieved, returning the front and rear disc brake caliper pistons and brake pads to the unapplied position.

For information on the following:

- Front disc brakes, refer to [Section 206-03](#) .
  - Rear disc brakes, refer to [Section 206-04](#) .
  - Parking brake actuation, refer to [Section 206-05](#) .
  - Hydraulic brake actuation, refer to [Section 206-06](#) .
  - Vacuum-assisted power brake booster, refer to [Section 206-07](#) .
  - ABS, refer to [Section 206-09](#) .
-

## Principles of Operation

### Brake System

Applying the brake pedal uses lever action to push a rod into the brake booster, which through the use of vacuum, boosts the force of the rod and then transmits this force to the primary piston in the master cylinder. This produces hydraulic pressure in the master cylinder. This pressure builds in the master cylinder and brake tubes as the brake pedal is applied further. The pressure between the primary and secondary piston forces the secondary piston to compress, building pressure in its circuit. The hydraulic pressure is transmitted by brake fluid through the brake tubes to the ABS Hydraulic Control Unit (HCU), which then distributes that pressure to the individual brake calipers. The brake calipers use hydraulic pressure to apply the pads. The application of the brake pads will cause the rotation of the wheels to slow or stop, depending on how much brake pressure is applied. The parking brakes carry out the same function except that they are mechanically actuated by a cable that connects only to the rear brakes.

### Brake Master Cylinder Compensator Ports

The purpose of the compensator ports in the brake master cylinder is to supply additional brake fluid from the master cylinder reservoir when needed by the brake system due to brake lining wear and allow brake fluid to return to the master cylinder reservoir when the brakes are released. The returning brake fluid creates a slight turbulence in the master cylinder reservoir. This is a normal condition and indicates that the compensator ports are not clogged. Clogged compensator ports may cause the brakes to hang up or not fully release.

### Red Brake Warning Indicator

The red brake warning indicator alerts the driver to certain conditions that exist in the brake system. The Instrument Cluster (IC) performs a bulb check when the ignition key is turned to the RUN position. The conditions that cause the indicator to illuminate are low brake fluid level, the parking brake is applied or there is a fault in the ABS (if the yellow ABS warning indicator is also illuminated). To diagnose red brake warning indicator concerns, refer to [Section 413-01](#).

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**Inspection And Verification**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1

**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Blistering or swelling of rubber brake components can indicate contamination of the brake fluid by a petroleum-based substance. The entire hydraulic brake system must be flushed with clean, specified brake fluid and contaminated rubber components must be replaced to prevent recontamination.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

The first indication that something may be wrong in the brake system is a change in the feel through the brake pedal. The brake warning indicator in the Instrument Cluster (IC) and the brake fluid level in the brake master cylinder reservoir are also indicators of system concerns.

If a wheel is locked and the vehicle must be moved, open a bleeder screw at the locked wheel to let out enough fluid to relieve the pressure. Close the bleeder screw. If multiple wheels are locked, check the brake pedal free play to verify brake pedal is not partially applied. These operations may release the brakes, but will not correct the concern. If this does not relieve the locked wheel condition, repair the locked components before proceeding.

1. Verify the customer concern.

- For parking brake concerns, refer to [Section 206-05](#) .
- For ABS concerns, refer to [Section 206-09](#) .
- For all other concerns, continue with the next step.

2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

<b>Mechanical</b>	<b>Electrical</b>
<ul style="list-style-type: none"> <li>• Brake fluid level and condition</li> <li>• Brake master cylinder</li> <li>• Brake master cylinder reservoir</li> <li>• Brake booster</li> <li>• Brake booster check valve</li> <li>• Brake booster vacuum hose</li> <li>• Brake hoses and tubes</li> <li>• Brake caliper, guide pins and anchor plate</li> <li>• Brake disc</li> <li>• Brake pads</li> <li>• Brake pedal, bracket and booster linkage</li> <li>• Aftermarket modifications</li> </ul>	<ul style="list-style-type: none"> <li>• Parking brake switch</li> <li>• Brake fluid level switch</li> <li>• Wiring, terminals or connectors</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
    - For suspension system concerns, refer to Section 204-00 .
    - For tire concerns, refer to Section 204-04 .
  4. If brake system concern is not evident, visually inspect the suspension system and tires for obvious signs of wear or damage.
  5. If the cause is not visually evident, GO to Symptom Chart - Brake System or GO to Symptom Chart - NVH in this section.
-



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**Symptom Chart****Symptom Chart - Brake System**

Symptom Chart - Brake System

**Symptom Chart - NVH**

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

**Condition Possible Sources Action**

- Vibration when the brakes are applied
  - Brake disc(s)
  - Suspension components
  - GO to Pinpoint Test A .
- Brake vibration/shudder - occurs when the brake pedal is released
  - Brake drag
  - GO to Symptom Chart - Brake System .
- Rear brake noise - occurs when the brake pedal is unapplied
  - Parking brake component
  - REFER to Section 206-05 to diagnose the parking brake system.
- Rattling noise
  - Caliper guide pins or guide pin bolts
  - CHECK the caliper guide pins and guide pin bolts. REFER to Brake System Inspection in this section.
  - Missing or damaged anti-rattle clips or springs



## 2010 Crown Victoria, Grand Marquis Workshop Manual

- CHECK the brake pads for missing clips or broken springs. INSTALL new components as necessary. REFER to [Section 206-03](#) for front disc brakes or [Section 206-04](#) for rear disc brakes.
  - Loose brake disc shield
  - TIGHTEN the brake disc shield bolts to specification. REFER to [Section 206-03](#) for front disc brakes or [Section 206-04](#) for rear disc brakes.
  - Squealing noise - occurs on first (morning) brake application
  - Brake pads
  - Acceptable condition. Caused by humidity and low brake pad temperature.
  - Squealing noise - a continuous squeal
  - Brake pads
  - INSPECT the brake pads. REFER to [Brake System Inspection](#) in this section.
  - Squealing noise - an intermittent squeal
  - Brake pads
  - Acceptable condition. Caused by cold, heat, water, mud or snow.
  - Groaning noise - occurs at low speeds with brake lightly applied (creeping)
  - Brake pads
  - Acceptable condition.
  - Grinding/moaning noise - continuous
  - Brake pads
  - Brake disc
  - INSPECT the brake pads, brake discs and attaching hardware for damage. VERIFY brake components are within specifications. REFER to [Brake System Inspection](#) in this section.
-



**Pinpoint Tests****Pinpoint Test A: Vibration When the Brakes are Applied****Normal Operation**

During moderate to heavy braking, noise from the Hydraulic Control Unit (HCU) and pulsation in the brake pedal can be observed. Pedal pulsation coupled with noise during heavy braking or on loose gravel, bumps, wet or snowy surfaces is acceptable and indicates correct functioning of the ABS. Pedal pulsation or steering wheel nibble when the brakes are applied (frequency is proportioned to the vehicle speed) indicates a concern with a brake or suspension component.

**PINPOINT TEST A: VIBRATION WHEN THE BRAKES ARE APPLIED**

Test Step	Result / Action to Take
<b>A1 ROAD TEST THE VEHICLE - LIGHT BRAKING</b>	
<ul style="list-style-type: none"> <li>Road test the vehicle. Warm the brakes by slowing the vehicle from 80 to 32 km/h (50 to 20 mph) using light brake force. At highway speeds of 89-97 km/h (55-60 mph), apply the brake using light pedal force.</li> <li><b>Is there a vibration/shudder felt in the steering wheel, seat or brake pedal?</b></li> </ul>	<b>Yes</b> GO to <u>A4</u> .  <b>No</b> GO to <u>A2</u> .
<b>A2 ROAD TEST THE VEHICLE - MODERATE TO HEAVY BRAKING</b>	
<ul style="list-style-type: none"> <li>Road test the vehicle. At highway speeds of 89-97 km/h (55-60 mph), apply the brake using a moderate to heavy pedal force.</li> <li><b>Is there a vibration/shudder?</b></li> </ul>	<b>Yes</b> GO to <u>A3</u> .  <b>No</b> The concern is not present at this time.
<b>A3 CHECK ABS OPERATION</b>	
<ul style="list-style-type: none"> <li><b>NOTE:</b> During moderate to heavy braking, noise from the HCU and pulsation in the brake pedal can be observed. Pedal pulsation coupled with noise during heavy braking or on loose gravel, bumps, wet or snowy surfaces is acceptable and indicates correct operation of the ABS. Pedal pulsation or steering wheel nibble with the frequency proportional to vehicle speed indicates a concern with a brake or suspension component.</li> <li>Road test the vehicle and apply the brakes on a dry, firm surface, then apply the brakes on a wet, snowy or loose surface (such as gravel).</li> <li><b>Is the vibration/shudder only present on a wet, snowy or loose surface?</b></li> </ul>	<b>Yes</b> This is a normal operating condition of the ABS.  <b>No</b> GO to <u>A5</u> .
<b>A4 ISOLATE BRAKE VIBRATION</b>	

<ul style="list-style-type: none"> <li>• <b>NOTE:</b> This test is not applicable to vehicles with drum-in-hat type parking brakes. For vehicles with drum-in-hat parking brakes, proceed to the next test step. For all other vehicles, apply the parking brake to identify if the problem is in the front or rear brake.</li> <li>• Apply the parking brake to identify if the problem is in the front or rear brake. At highway speeds of 89-97 km/h (55-60 mph), lightly apply the parking brake until the vehicle slows down. Release the parking brake immediately after the test.</li> <li>• <b>Is there a vibration/shudder?</b></li> </ul>	<p><b>Yes</b> GO to <u>A7</u> .</p> <p><b>No</b> GO to <u>A5</u> .</p>
<b>A5 CHECK THE FRONT SUSPENSION</b>	
<ul style="list-style-type: none"> <li>• Check the front suspension. Refer to <u>Section 204-00</u> .</li> <li>• <b>Are all the suspension components in satisfactory condition?</b></li> </ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p>
<b>A6 CHECK THE FRONT BRAKE DISCS</b>	
<ul style="list-style-type: none"> <li>• Inspect the front brake discs. Refer to <u>Brake System Inspection</u> in this section.</li> <li>• Road test the vehicle.</li> <li>• <b>Is the vibration/shudder present?</b></li> </ul>	<p><b>Yes</b> GO to <u>A7</u> .</p> <p><b>No</b> The concern has been repaired.</p>
<b>A7 CHECK THE REAR SUSPENSION</b>	
<ul style="list-style-type: none"> <li>• Check the rear suspension. Refer to <u>Section 204-00</u> .</li> <li>• <b>Are all the suspension components in satisfactory condition?</b></li> </ul>	<p><b>Yes</b> INSPECT the rear brake discs. REFER to <u>Brake System Inspection</u> in this section.</p> <p><b>No</b> REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p>



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## Component Tests

### Brake Booster

1. Disconnect the check valve from the brake booster and connect a suitable vacuum/pressure tester to the booster side of the check valve.
2. Apply the parking brake, start the engine and place the transmission in NEUTRAL.
  - Allow the engine to reach normal operating temperature.
3. **NOTE:** Subtract approximately 3.38 kPa (1 in-Hg) from the specified reading for every 304.8 m (1,000 ft) of elevation above sea level.

Verify that vacuum is available at the check valve with engine running at normal idle speed.

- The vacuum gauge should read between 51-74 kPa (15-22 in-Hg).
  - If specified vacuum is available, stop the engine, connect the check valve and continue with Step 5.
  - If specified vacuum is not available, continue with Step 4.
4. Disconnect the check valve from the vacuum hose and verify that the specified vacuum is available at the hose with the engine at idle speed and the transmission in NEUTRAL.
    - If specified vacuum is available, stop the engine, install a new check valve and continue with Step 5.
    - If specified vacuum is not available, stop the engine, connect the vacuum hose to the check valve and refer to Section 303-00 to diagnose the no/low vacuum condition.
  5. Apply the brake pedal several times to exhaust all vacuum from the system.
  6. Apply the brake pedal and hold it in the applied position. Start the engine and verify that the brake pedal moves downward after the engine starts.
    - If the brake pedal moves, the brake booster is operating correctly.
    - If the brake pedal does not move, install a new brake booster. Refer to Section 206-07 .
  7. Operate the engine a minimum of 20 seconds at idle. Stop the engine and let the vehicle stand for 10 minutes, then apply the brake pedal. The brake pedal feel should be the same as that noted with the engine operating.
    - If the brake pedal feels hard (no power assist), install a new brake booster check valve and retest.
    - If condition still exists, install a new brake booster. Refer to Section 206-07 .
    - If the brake pedal feels the same as noted with the engine operating, the check valve is functioning properly.

### Brake Master Cylinder - Bypass Condition

1. Inspect the master cylinder. Refer to Brake System Inspection in this section.
2. Disconnect the brake tubes from the master cylinder.

3. Plug the outlet ports of the master cylinder.

4. **NOTE:** Make sure that the outlet port plugs do not show signs of leakage.

Lightly apply the brakes and hold for 10 seconds. Release the brakes and then reapply with heavy force. If brake pedal height cannot be maintained, the brake master cylinder has an internal leak and a new brake master cylinder must be installed.

- If brake pedal height is maintained, reinstall brake tubes and tighten to specifications. Refer to specifications in this section. After installation, bleed the brake system. Refer to Brake System Bleeding in this section.

### **Brake Master Cylinder - Compensator Port**

1. With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02A .
  2. Apply and release the brakes.
  3. With the brakes released, attempt to rotate each wheel and check for any brake drag.
    - If an excessive amount of brake drag exists at multiple wheels, continue to Step 4.
    - If an excessive amount of brake drag exists at only one wheel, it indicates a possible seized brake caliper, brake wheel cylinder or parking brake component. Repair or install new components as necessary.
  4. Check the brake stoplamp switch and the brake pedal free play to verify that the brake pedal is not partially applied.
  5. Loosen the brake master cylinder nuts and position the brake master cylinder away from the brake booster.
  6. With the brakes released, attempt to rotate each wheel and check for any brake drag.
    - If the brake drag is no longer present, install a new brake booster. Refer to Section 206-07 .
    - If the brake drag is still present, install a new master cylinder. Refer to Section 206-06 .
-





**Brake System Inspection**

## Material

Item	Specification
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A

**Brake Pads**

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTE:** It is not required to install new brake pads when the brake discs are machined.

1. Inspect and measure the thickness of the brake pad friction material. For additional information, refer to Specifications in this section.
  - Minor surface cracks do not require pad replacement, however, if there are missing chunks or cracks in the lining through to the backing plate, install new brake pads. For additional information, refer to **Section 206-03** for front brake pads or **Section 206-04** for rear brake pads.
  - If the thickness of the friction material is less than the specified thickness, install new brake pads. For additional information, refer to **Section 206-03** for front disc brakes or **Section 206-04** for rear disc brakes.
  - If the friction material shows taper wear that is not within specifications, install new brake pads and verify the caliper guide pins are functioning correctly. For additional information, refer to Brake Caliper Guide Pins inspection.

**Brake Discs**

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** Using an impact tool without a torque socket will lead to unevenly tightened wheel nuts. This causes brake disc on-vehicle lateral runout and brake roughness.

**NOTE:** It is generally not required to install new brake discs to address noise issues.

1. Inspect the brake discs and measure the brake disc thickness. Record the measurement, refer to Specifications in this section.
  - If the brake disc is cracked or otherwise damaged, install a new brake disc. For additional information, refer to **Section 206-03** for front brakes or **Section 206-04** for rear brakes.

- If the measurement is below the minimum thickness specification, install a new brake disc. For additional information, refer to [Section 206-03](#) for front brakes or [Section 206-04](#) for rear brakes.
- If the diagnosis has revealed vibration in the steering wheel, seat or pedal while braking that varies with vehicle speed, machine the brake disc. Heavily scored brake discs, similar to that caused by pads worn down to the backing plate, should also be machined. In order to machine, discs must be above the minimum thickness specification. For additional information, refer to Specifications and [Brake Disc Machining](#) in this section.

## Brake Calipers

**⚠ WARNING: If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

1. Inspect the brake calipers for leaks, damage to seals, and piston corrosion or binding.
  - If the brake caliper is leaking or otherwise damaged, install a new brake caliper. For additional information, refer to [Section 206-03](#) for front brake calipers or [Section 206-04](#) for rear brake calipers.

## Brake Caliper Guide Pins

**⚠ WARNING: If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

1. The guide pins should slide with a reasonable amount of hand force. If the brake pads show taper wear or the guide pins are difficult to move, carry out the following steps.
  - Disassemble the brake caliper guide pins and inspect the guide pins and guide pin bores for wear, damage and corrosion. If bore is worn or damaged, replace the damaged component.
  - Use a wire brush, rolled-up sandpaper or emery cloth to remove all corrosion and foreign material from the caliper guide pin bores. Clean any remaining foreign material from the bores with brake parts cleaner and compressed air.
  - Assemble the caliper guide pins using new caliper seals, boots and guide pins. Use an ample amount of the specified grease to lubricate the bores and guide pins.
  - Inspect the brake pads. For additional information, refer to Brake Pads inspection in this section.

## Brake Flexible Hoses and Tubes

**⚠ WARNING: If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

**NOTICE: Never use copper tubing. It is subject to fatigue, cracking and corrosion, which may result in brake tube failure.**

**NOTE:** Double-wall steel tubing is used throughout the brake hydraulic system. All brake tube fittings must be correctly double flared to provide strong, leakproof connections. When bending tubing to fit the underbody or rear axle contours, be careful not to kink or crack the tube.

1. Inspect brake tubes for corrosion, cracks, leaks or any other signs of damage.
  - If a section of the brake tube is damaged, the entire section must be installed with a new tube of the same type, size, shape and length.

- When installing the hydraulic brake tubing, hoses or connectors, tighten all connections to specifications. After installation, bleed the brake system. For additional information, refer to Brake System Bleeding in this section.
2. Inspect the brake flexible hoses for cracks, leaks and swelling during brake application or any other signs of damage.
    - Install a new brake flexible hose if the hose shows signs of softening, cracking or other damage. For additional information, refer to Section 206-03 for the front brake flexible hose or Section 206-04 for the rear brake flexible hose.

### Brake Master Cylinder

**NOTE:** During normal operation of the brake master cylinder, the fluid level in the brake master cylinder reservoir will fall during brake application and rise during release. The net fluid level (such as after brake application and release) will remain unchanged. Fluid level will decrease with pad wear.

**NOTE:** A trace of brake fluid will exist on the booster shell below the master cylinder mounting flange. This results from the normal lubricating action of the master cylinder bore and seal.

1. Inspect the brake master cylinder for fluid leaks.
  - Install a new master cylinder or brake fluid reservoir if signs of excessive leaking are present. For additional information, refer to Section 206-06.
  - To check for correct brake master cylinder operation, refer to Component Tests in this section.

### Brake Booster

1. Inspect the brake booster for excessive corrosion or damage. Inspect the vacuum hoses for leaks and kinks.
    - Install a new brake booster if signs of excessive corrosion or damage is found. For additional information, refer to Section 206-07.
    - Repair or replace vacuum hoses as necessary.
    - To check for correct brake booster operation refer to Component Tests in this section.
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## Brake Disc Machining

**NOTE:** Do not use a bench lathe to machine the brake discs. Use an on-vehicle brake lathe only. Read the entire operating manual and/or view the video shipped with the lathe before installing, operating or repairing the lathe.

**NOTE:** An on-vehicle brake lathe with an automatic runout adjustment feature is preferred. However, if the lathe is not self adjusting, the lathe oscillation must be adjusted using a dial indicator. The total indicated runout target is 0.000 mm (0.000 in). The maximum indicated runout should be no more than 0.050 mm (0.002 in). If the runout adjustment (automatic or manual) is carried out correctly prior to machining, then the final brake disc runout will be within specification, and a runout measurement is not necessary after machining.

**NOTE:** Do not machine new brake discs.

**NOTE:** Lateral runout and disc thickness variation measurements are not required because correct adjustment of the on-vehicle brake lathe will make sure that these dimensions are within specifications.

1.  **WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to Section 204-04 .

2. **NOTICE:** Do not allow the caliper to hang from the brake hose or damage to the hose may occur.

**NOTE:** It is not necessary to disconnect the brake tube from the brake caliper.

Remove the bolts and position the brake caliper or brake caliper and anchor plate assembly aside, as required.

- Support the brake caliper using mechanic's wire.

3. Install the hub adapter using:
  - four wheel nuts on a 4-stud wheel hub.
  - five wheel nuts on a 5-stud wheel hub.
  - six wheel nuts on a 6-stud wheel hub.
  - four wheel nuts on a 7- or 8-stud wheel hub.
  - five wheel nuts on a 10-stud wheel hub.
4. Install the cutting lathe.
5. If the lathe is not self adjusting, adjust the lathe oscillation using a dial indicator. The total indicated runout target is 0.000 mm (0.000 in). The maximum indicated runout should be no more than 0.050 mm (0.002 in).
6. Center the cutting head, adjust the cutting bits and install the chip deflector/silencer.

7. **NOTE:** The depth of the cut should be between 0.10 and 0.40 mm (0.004 and 0.015 in). Lighter cuts will cause the bit to heat up and wear faster. Heavier cuts will cause poor brake disc surface finish.

Machine the brake disc.

8. Remove the lathe and the silencer.
9. Remove the wheel nuts and hub adapter.
10. Remove the metal shavings.
11. Measure the brake disc thickness.
- If the measurement is below the minimum specification, install a new brake disc. For additional information, refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
12. **NOTE:** It is not required to install new brake pads if friction material is within specifications. For additional information, refer to Specifications in this section.

Position the brake caliper or brake caliper and anchor plate assembly.

- Install the bolts.
  - For fastener torque specifications, refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
13. Install the wheel and tire. For additional information, refer to Section 204-04 .
14. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Component Bleeding****Material**

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1

**Master Cylinder**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not allow the brake master cylinder reservoir to run dry during the bleeding operation. Keep the brake master cylinder reservoir filled with clean, specified brake fluid. Never reuse the brake fluid that has been drained from the hydraulic system. Damage to the brake system components may occur.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

**NOTE:** When any part of the hydraulic system has been disconnected for repair or installation of new components, air can enter the system and cause spongy brake pedal action. This requires bleeding of the hydraulic system after it has been correctly connected. The hydraulic system can be bled manually or with pressure bleeding equipment.

**NOTE:** When a new brake master cylinder has been installed or the system has been emptied, or partially emptied, it should be primed to prevent air from entering the system.

1. Place a box-end wrench on the master cylinder bleeder screw and attach a rubber drain hose to the bleeder screw. Submerge the free end of the rubber hose into the master cylinder reservoir.
2. Fill the master cylinder reservoir with clean, specified brake fluid.
3. Have an assistant pump the brake pedal until clear fluid flows from the rubber hose, without air bubbles.
4. Tighten the master cylinder bleeder screw to specification. Refer to Specifications in this section.
  - Remove the rubber hose.

5. Bleed the brake system, refer to Brake System Bleeding in this section.

### Brake Caliper

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not allow the brake master cylinder reservoir to run dry during the bleeding operation. Keep the brake master cylinder reservoir filled with clean, specified brake fluid. Never reuse the brake fluid that has been drained from the hydraulic system. Damage to the brake system components may occur.

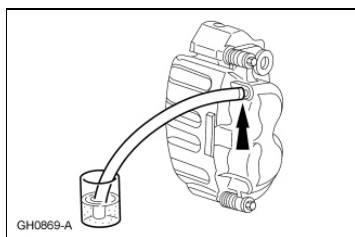
**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

If equipped with a fire suppression system, depower the system.

2. **NOTE:** It is not necessary to do a complete brake system bleed if only the disc brake caliper was disconnected.

Remove the brake caliper bleeder screw cap and place a box-end wrench on the bleeder screw. Attach a rubber drain hose to the bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.



3. Have an assistant pump the brake pedal and then hold firm pressure on the brake pedal.
4. Loosen the bleeder screw until a stream of brake fluid comes out. While the assistant maintains pressure on the brake pedal, tighten the bleeder screw.
- Repeat until clear, bubble-free fluid comes out.
  - Refill the brake master cylinder reservoir as necessary.
5. Tighten the brake caliper bleeder screw to specification. Refer to Specifications in this section.
- Remove the rubber hose and install the bleeder screw cap.
6. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these




**instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Brake System Bleeding**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1

**Pressure Bleeding**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not allow the brake master cylinder reservoir to run dry during the bleeding operation. Keep the brake master cylinder reservoir filled with clean, specified brake fluid. Never reuse the brake fluid that has been drained from the hydraulic system. Damage to the brake system components may occur.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

**NOTE:** Pressure bleeding the brake system is preferred to manual bleeding.

**NOTE:** When any part of the hydraulic system has been disconnected for repair or installation of new components, air can get into the system and cause spongy brake pedal action. This requires bleeding of the hydraulic system after it has been correctly connected.

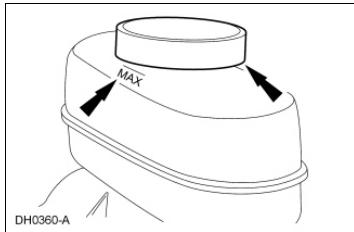
**NOTE:** The Hydraulic Control Unit (HCU) bleeding procedure must be carried out if the HCU or any components upstream of the HCU are installed new.

**NOTE:** Pressure bleed the brake system at 207-345 kPa (30-50 psi).

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

If equipped with a fire suppression system, depower the system.

2. Clean all dirt from and remove the brake master cylinder filler cap.
  - Fill the brake master cylinder reservoir with clean, specified brake fluid.



3. **NOTE:** Master cylinder pressure bleeder adapter tools are available from various manufacturers of pressure bleeding equipment. Follow the instructions of the manufacturer when installing the adapter.

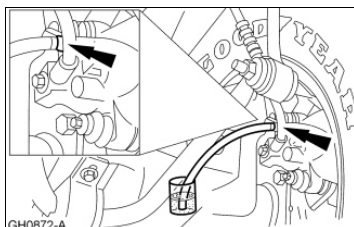
Install the bleeder adapter to the brake master cylinder reservoir and attach the bleeder tank hose to the fitting on the adapter.

4. Place a box-end wrench on the master cylinder bleeder screw. Attach a rubber drain hose to the bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.

5. **NOTE:** Make sure the bleeder tank contains enough clean, specified brake fluid to complete the bleeding operation.

Open the valve on the bleeder tank.

- Apply 207-345 kPa (30-50 psi) to the brake system.
6. Loosen the bleeder screw and leave open until clear, bubble-free brake fluid flows into the container.
    - Tighten the master cylinder bleeder screw to specification. Refer to Specifications in this section.
    - Remove the rubber hose.
  7. Remove the brake caliper bleeder screw cap and place a box-end wrench on the bleeder screw. Attach a rubber drain hose to the RH rear brake caliper bleeder screw, and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.



8. Loosen the bleeder screw and leave open until clear, bubble-free brake fluid flows into the container.
9. Tighten the brake caliper bleeder screw to specification. Refer to Specifications in this section.
  - Remove the rubber hose and install the bleeder screw cap.

10. Repeat Steps 7 through 9 for the LH rear, RH front and LH front bleeder screws in this order.
11. Release the bleeder tank pressure and close the bleeder tank valve. Remove the tank hose from the adapter and remove the adapter.
  - Install the reservoir cap.

12. **NOTE:** If the brake pedal remains spongy, air may be trapped in the HCU .

If the brake pedal remains spongy after pressure bleeding, carry out the ABS HCU bleeding procedure in this section with the scan tool.

13. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

### Manual Bleeding

**⚠ WARNING: Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.**

**⚠ WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.**

**NOTICE: Do not allow the brake master cylinder reservoir to run dry during the bleeding operation. Keep the brake master cylinder reservoir filled with clean, specified brake fluid. Never reuse the brake fluid that has been drained from the hydraulic system. Damage to the brake system components may occur.**

**NOTICE: Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.**

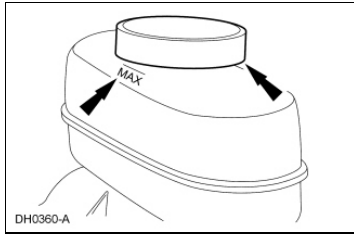
**NOTE:** The HCU bleeding procedure must be carried out if the HCU or any components upstream of the HCU are installed new.

**NOTE:** Pressure bleeding the brake system is preferred to manual bleeding.

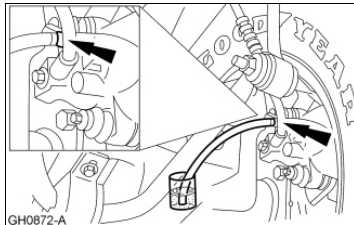
1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

If equipped with a fire suppression system, depower the system.

2. Clean all dirt from the brake master cylinder filler cap and remove the filler cap.
  - Fill the brake master cylinder reservoir with clean, specified brake fluid.



3. Place a box-end wrench on the master cylinder bleeder screw. Attach a rubber drain hose to the bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.
4. Loosen the bleeder screw and leave open until clear, bubble-free brake fluid flows into the container.
  - Tighten the master cylinder bleeder screw to specification. Refer to Specifications in this section.
  - Remove the rubber hose.
5. Remove the brake caliper bleeder screw cap and place a box end wrench on the RH rear bleeder screw. Attach a rubber drain hose to the bleeder screw and submerge the free end of the hose in a container partially filled with clean, specified brake fluid.



6. Have an assistant pump the brake pedal and then hold firm pressure on the brake pedal.
7. Loosen the bleeder screw until a stream of brake fluid comes out. While the assistant maintains pressure on the brake pedal, tighten the bleeder screw.
  - Repeat until clear, bubble-free fluid comes out.
  - Refill the brake master cylinder reservoir as necessary.
8. Tighten the brake caliper bleeder screw to specification. Refer to Specifications in this section.
  - Remove the rubber hose and install the bleeder screw cap.
9. Repeat Steps 5 through 8 for the LH rear, RH front and LH front bleeder screws in this order.
10. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**


If equipped with a fire suppression system, repower the system.

## Hydraulic Control Unit (HCU)

**NOTE:** Pressure bleeding the brake system is preferred to manual bleeding.

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

If equipped with a fire suppression system, depower the system.

2. Follow the Pressure Bleeding or Manual Bleeding procedure steps to bleed the system. For additional information, refer to Brake System Bleeding in this section.
3. Connect the scan tool and follow the ABS Service Bleed instructions.
4. Repeat the Pressure Bleeding or Manual Bleeding procedure steps to bleed the system.
5.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Material

Item	Specification	Fill Capacity
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	780 ml (1.6 pt)
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A	-
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-	-

## General Specifications

Item	Specification
<b>Brake Disc</b>	
Brake disc minimum thickness	26.35 mm (1.037 in)
<b>Brake Pads</b>	
Brake pad maximum taper wear (in any direction)	3.0 mm (0.118 in)
Brake pad minimum thickness	3.0 mm (0.118 in)

## Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate bolts	160	118	-
Brake caliper flow bolt	48	35	-
Brake caliper guide pin bolts	36	27	-
Brake flexible hose bracket bolt	20	-	177
Brake tube fitting	17	-	150





## **Front Disc Brake**

The front brake disc system consists of the following components:

- Brake pads
- Brake caliper anchor plate
- Brake caliper
- Brake disc
- Brake disc shield
- Brake flexible hose

When mechanical force is applied by the driver to the brake pedal, the force is converted into hydraulic pressure by the master cylinder. The hydraulic force is directed to the disc brake calipers and transferred to the brake pads. The brake pads are then forced against the brake friction surfaces by the brake caliper pistons. The friction of the brake pads on the brake disc causes the slowing of wheel rotation and the vehicle.

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## **Front Disc Brake**

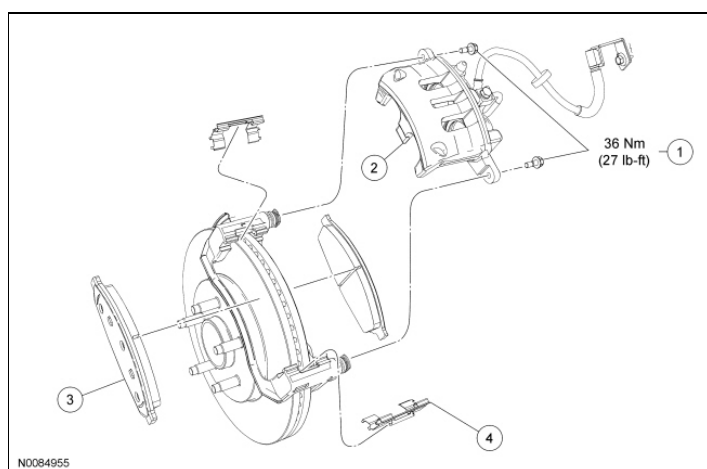
Refer to Section 206-00 .

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**Brake Pads**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	2N386	Brake caliper bolts (2 required)
2	2B120	Brake caliper
3	2001	Brake pad (2 required)
4	-	Stainless steel slide (2 required) (part of 2001)

**Removal and Installation**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

1. Check the brake fluid level in the brake master cylinder reservoir.
  - If required, remove the fluid until the brake master cylinder reservoir is half full.
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may

**result in serious personal injury.**

Remove the wheel and tire. For additional information, refer to Section 204-04 .

3. **NOTICE: Do not pry in the caliper sight hole to retract the pistons, as this can damage the pistons and boots.**

**NOTICE: Do not allow the brake caliper to hang from the brake hose or damage to the hose may occur.**

Remove the 2 brake caliper guide pin bolts and position the caliper aside.

- To install, tighten to 36 Nm (27 lb-ft).
- Support the caliper using mechanic's wire.

4. Remove the pads and stainless steel slides from the anchor plate.
- Discard the slides.

5. **NOTICE: Protect the piston and boots when pushing the caliper piston into the caliper piston bores or damage to components may occur.**

If installing new brake pads, using a suitable tool and a worn brake pad, compress the disc brake caliper pistons into the caliper.

6. To install, reverse the removal procedure.
- Install new slides.
  - Fill the brake master cylinder reservoir with clean specified brake fluid. Install the brake master cylinder filler cap.

7. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

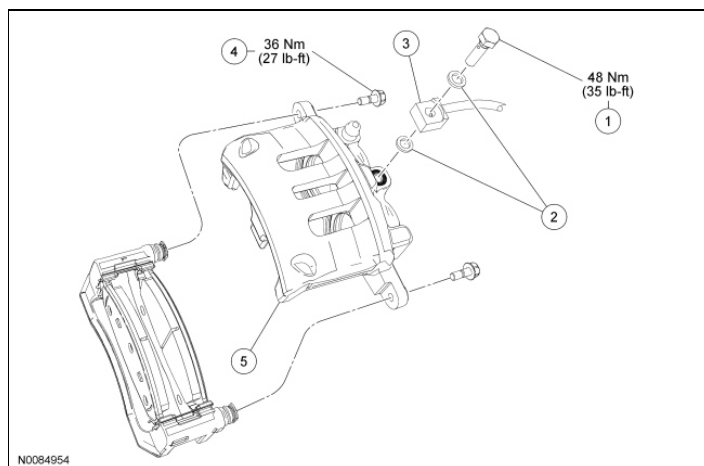
8. Apply brakes several times to verify correct brake operation.
-



**Brake Caliper**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	385116	Brake caliper flow bolt
2	388949	Copper washers
3	2078	Brake hose
4	2N386	Brake caliper bolt (2 required)
5	2B120	Brake caliper

**Removal**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .


2. Remove the brake caliper flow bolt.
  - Discard the 2 copper washers.
3. Remove the 2 brake guide pin caliper bolts and the brake caliper.
  - Disconnect the brake pads from the caliper and remove the caliper.
4. Inspect the brake caliper for wear or damage. Inspect the guide pins and locating pins for wear or damage.
  - If leaks or damage are found, install a new brake caliper.

### Installation

1. **NOTICE:** Make sure guide pin boots are correctly seated or damage to guide pins may occur.

**NOTE:** Tighten the lower brake caliper bolt first.

Install the brake caliper to the anchor plate and install the 2 brake caliper guide pin bolts.

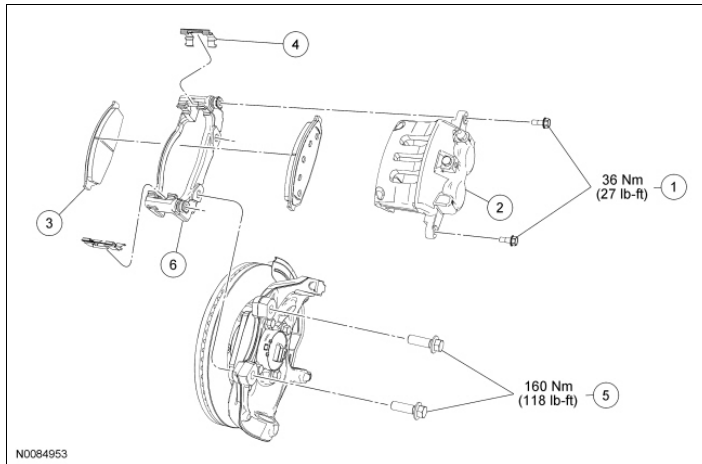
- Tighten to 36 Nm (27 lb-ft).
2. Using 2 new copper washers, position the brake hose and install the brake caliper flow bolt.
    - Tighten to 48 Nm (35 lb-ft).
  3. Bleed the brake caliper. For additional information, refer to [Section 206-00](#) for component bleeding.
  4. Install the wheel and tire. For additional information, refer to [Section 204-04](#) .
  5.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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**Brake Caliper Anchor Plate**

Item	Part Number	Description
1	2N386	Brake caliper bolts (2 required)
2	2B120	Brake caliper
3	2001	Brake pad (2 required)
4	-	Stainless steel slide (2 required) (part of 2001)
5	W707589	Brake caliper anchor plate bolts (2 required)
6	2B292	Brake caliper anchor plate

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

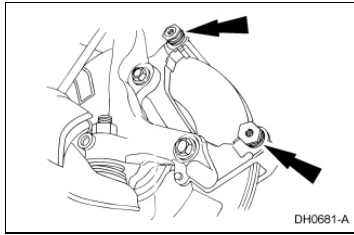
Remove the wheel and tire. For additional information, refer to **Section 204-04**.

2. **NOTICE:** Do not pry in the caliper sight hole to retract the pistons, as this may damage the pistons and boots.

**NOTICE:** Do not allow the brake caliper to hang from the brake hose or damage to the hose may occur.

Remove the 2 brake caliper guide pin bolts and position the caliper aside.

- Support the caliper using mechanic's wire.
  - To install, tighten to 36 Nm (27 lb-ft).
3. Remove the brake pads and stainless steel slides from the brake caliper anchor plate.
  4. Remove the guide pins and guide pin boots.
    - Check the guide pins for binding and damage.
    - Install new guide pins if worn or damaged.



5. **NOTE:** When installing the brake caliper anchor plate, new brake caliper anchor plate bolts must be used.

Remove the 2 brake caliper anchor plate bolts and the brake caliper anchor plate.

- Discard the bolts.
- To install, tighten new anchor plate bolts to 160 Nm (118 lb-ft).

6. To install, reverse the removal procedure.

7. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

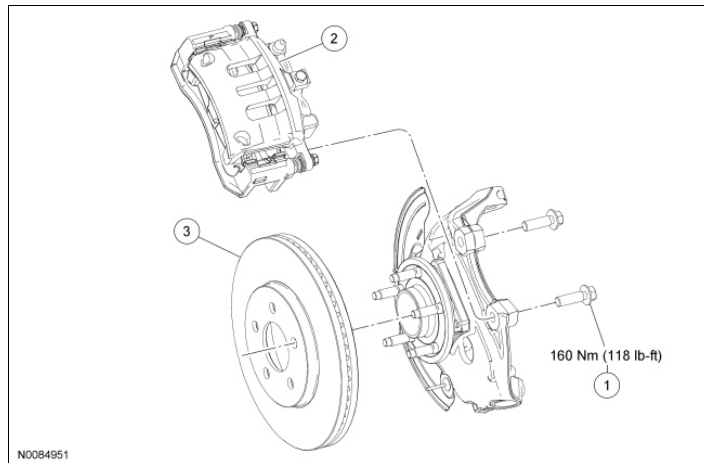
If equipped with a fire suppression system, repower the system.

- Apply brakes several times to verify correct brake operation.

**Brake Disc**

## Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-



Item	Part Number	Description
1	W707589	Brake caliper anchor plate bolt (2 required)
2	-	Brake caliper and anchor plate assembly
3	1125	Brake disc

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

2. **NOTICE:** Do not allow the brake caliper, brake pads and anchor plate assembly to hang from the brake hose or damage to the hose may occur.

Remove the 2 brake caliper anchor plate bolts and position the brake caliper, brake pads and anchor plate aside as an assembly.

- Discard the anchor plate bolts.
- Support the brake caliper, brake pads and anchor plate assembly using mechanic's wire.
- To install, tighten new anchor plate bolts to 160 Nm (118 lb-ft).

3. Match-mark the brake disc with a wheel stud.

- This will make sure the lowest brake disc runout is maintained during reassembly.

4. **NOTE:** If the brake disc cannot be removed easily, apply rust penetrant on brake disc to wheel hub mating surfaces.


Remove the retention ring and the brake disc.

- Discard the retention ring.

5. **NOTE:** Install a new retention ring.

To install, reverse the removal procedure.

- Clean any rust or foreign material from the brake disc, wheel and wheel hub.
- Use specified brake parts cleaner to clean the brake disc and hub surfaces.
- Apply specified anti-seize lubricant to the hub mounting surface to prevent future corrosion.

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

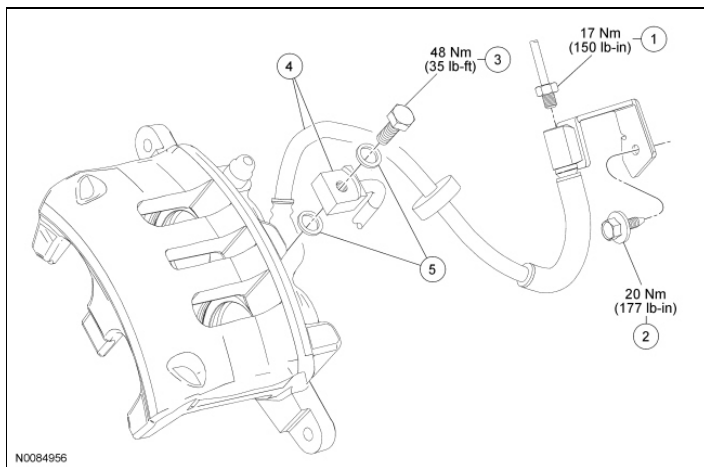
If equipped with a fire suppression system, repower the system.

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**Brake Flexible Hose**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	-	Brake tube fitting
2	W704901	Brake flexible hose bracket bolt
3	N807052	Brake caliper flow bolt
4	2078	Brake flexible hoses
5	388949	Copper washers

**Removal and Installation**


**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

2. Remove brake flexible hose bracket bolt.
  - To install, tighten to 20 Nm (177 lb-in).
3. Disconnect the brake tube fitting from the brake flexible hose.
  - To install, tighten to 17 Nm (150 lb-in).
4. Remove the brake caliper flow bolt and the brake flexible hose.
  - Discard the 2 copper washers.
  - To install, tighten to 48 Nm (35 lb-ft).
5. To install, reverse the removal procedure.
  - Install new copper washers.
  - Bleed the brake caliper. For additional information, refer to [Section 206-00](#) for Component Bleeding.
6.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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SECTION 206-04: Rear Disc Brake  
SPECIFICATIONS2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

## Material

Item	Specification	Fill Capacity
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	527 ml (1.1 pt)
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A	-
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-	-

## General Specifications

Item	Specification
<b>Brake Discs</b>	
Brake disc minimum thickness	18.0 mm (0.708 in)
<b>Brake Pads</b>	
Brake pad maximum taper wear (in any direction)	3.0 mm (0.118 in)
Brake pad minimum thickness	3.0 mm (0.118 in)

## Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate nuts	68	50	-
Brake caliper flow bolt	48	35	-
Brake caliper guide pin bolts	25	18	-
Brake flexible hose bracket bolt	20	-	177
Brake tube fitting	17	-	150





## **Rear Disc Brake**

The rear disc brake system consists of the following components:

- Brake caliper anchor plate
- Brake caliper
- Brake disc
- Brake flexible hose
- Brake pads

When mechanical force is applied by the driver to the brake pedal, the force is converted into hydraulic pressure by the master cylinder. The hydraulic force is directed to the disc brake calipers and transferred to the brake pads. The brake pads are then forced against the brake friction surfaces by the brake caliper pistons. The friction of the brake pads on the brake disc causes the slowing or stopping of wheel rotation and the vehicle.

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## **Rear Disc Brake**

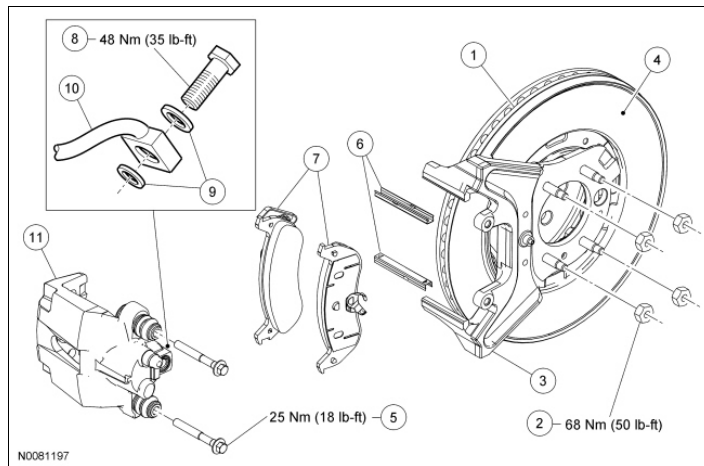
Refer to Section 206-00 .

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SECTION 206-04: Rear Disc Brake  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

### Disc Brake System - Exploded View



Item	Part Number	Description
1	2C026	Brake disc
2	W520214	Brake caliper anchor plate nut (4 required)
3	2C220	Brake caliper anchor plate
4	2C028	Brake disc shield
5	W500516	Brake caliper bolt (2 required)
6	2L200	Anti-rattle clips
7	2200	Brake pads
8	N807052	Brake caliper flow bolt
9	388949	Copper washers
10	2A442	Brake flexible hose
11	2K327	Brake caliper

1. For additional information, refer to the procedures in this section.



**Brake Caliper**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1

**Removal**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

- Remove the brake caliper flow bolt and disconnect the brake hose from the brake caliper.
  - Remove and discard the copper washers.
  - Plug the brake hose.
- NOTICE:** Do not remove the guide pins or guide pin boots unless a problem is suspected. The guide pins are meant to be sealed for life and are not repairable.

Remove the 2 brake caliper bolts and the brake caliper.

- Inspect the rear disc brake caliper for leaks and for binding slide pins.
  - If leaks or binding slide pins are found, install a new brake caliper.

**Installation**

- NOTE:** Make sure the anti-rattle clips are correctly positioned. Install new clips if worn or damaged.

Position the anti-rattle clip on the anchor plate rail.

- NOTICE:** To prevent interference with rear disc brake caliper operation, install only the correct caliper bolt.

**NOTE:** When installed, the locator notch on the brake pads will be located at the upper end of the rear disc brake caliper.

Position the brake caliper and install the 2 brake caliper bolts.

- Tighten to 25 Nm (18 lb-ft).
3. Position the brake hose and install the brake caliper flow bolt using 2 new copper washers.
    - Tighten to 48 Nm (35 lb-ft).
  4. Bleed the brake caliper. For additional information, refer to Section 206-00 for Component Bleeding.
  5. Install the wheel and tire. For additional information, refer to Section 204-04 .
  6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Brake Pads**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1

**Removal and Installation**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

1. Check the brake fluid level in the brake master cylinder reservoir.
  - If required, remove the fluid until the brake master cylinder reservoir is half full.
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

3. **NOTICE:** Do not pry in the caliper sight hole to retract the pistons, as this can damage the pistons and boots.

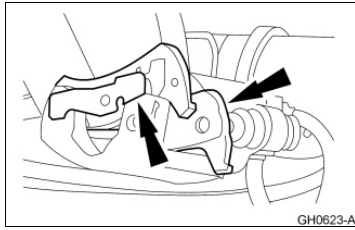
**NOTICE:** Do not allow the brake caliper to hang from the brake hose or damage to the hose may occur.

Remove the 2 brake caliper bolts and position the caliper aside.

- Support the brake caliper using mechanic's wire.
- To install, tighten to 25 Nm (18 lb-ft).

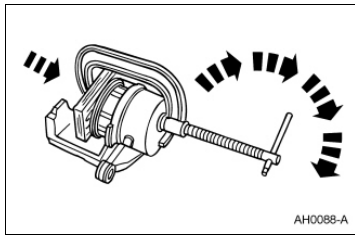
4. **NOTICE:** Do not allow grease, oil, brake fluid or other contaminants to contact the brake pads.

Remove the brake pads.



5. **NOTICE:** Protect the piston and boots when pushing the caliper piston into the caliper piston bores or damage to the piston or boot may occur.

If installing new brake pads, using a suitable tool and a worn brake pad, compress the disc brake caliper pistons into the caliper.



6. To install, reverse the removal procedure.
- Make sure the anti-rattle clips are clean and in good condition.
  - Fill the master cylinder with clean specified brake fluid.
7. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

- Apply brakes several times to verify correct brake operation.



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**Brake Disc****Material**

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	-

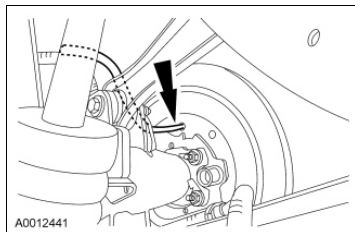
**Removal**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Remove the brake pads. For additional information, refer to **Brake Pads** in this section.

2. **NOTE:** If the brake disc binds on the rear parking brake shoes and linings, remove the adjustment hole access plug and retract the parking brake shoe and lining, using an adjusting tool.

Insert the tool at the end of the access plug slot farthest from the brake caliper. Engage the adjuster and rotate by raising the end of the tool toward the backing plate. Remove the brake disc.



3. Clean any rust or foreign material from the brake disc, the wheel and the wheel hub.
  - Use specified brake parts cleaner to clean the brake disc and hub surfaces.
  - Apply specified anti-seize lubricant to the hub flange and pilot area.
4. To install, reverse the removal procedure.
  - Apply brakes several times to verify correct brake operation.
5. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



**Brake Caliper Anchor Plate****Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Disconnect the rear parking brake cable and conduit. For additional information, refer to Section 206-05 .
3. Remove the axle shaft. For additional information, refer to Section 205-02 .

4. **⚠ WARNING:** Use tools, not fingers, to hold flagnuts. Flagnuts may slip or spin unexpectedly when removing fasteners. Failure to follow this instruction may result in injured fingers.

Remove the 4 retainers and the brake caliper anchor plate.

- To install, tighten to 68 Nm (50 lb-ft).

5. To install, reverse the removal procedure.

6. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

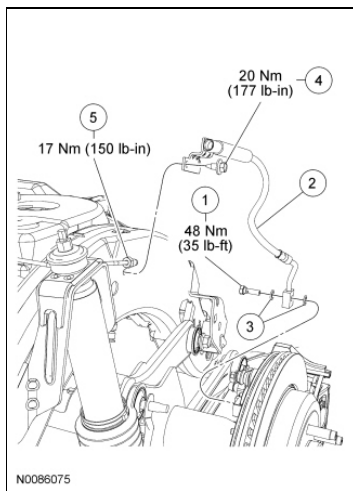
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**Brake Flexible Hose**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	N807052	Brake caliper flow bolt
2	2A442	Brake flexible hose
3	388949	Copper washers
4	W704901	Brake flexible hose bracket bolt
5	-	Brake tube fitting (part of 2267)

**Removal and Installation**


**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION** seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to Section 204-04 .

2. Remove the brake caliper flow bolt and discard the 2 copper washers.
  - To install, tighten to 48 Nm (35 lb-ft).
  - Install new copper washers.
3. Disconnect the brake tube fitting from the brake flexible hose.
  - To install, tighten to 17 Nm (150 lb-in).
4. Remove the bracket bolt and the brake flexible hose.
  - To install, tighten bolt to 20 Nm (177 lb-in).
5. To install, reverse the removal procedure.
  - Bleed the brake caliper. For additional information, refer to Section 206-00 for Component Bleeding.
6.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Material

Item	Specification	Fill Capacity
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A -	

## Torque Specifications

Description	Nm	lb-ft	lb-in
Brake caliper guide pin bolts	25	18	-
Front parking brake cable bracket bolt	12	-	106
Instrument panel cowl side bolt	50	37	-
Instrument panel cowl side nut	55	41	-
Parking brake control bolts	30	22	-
RH rear parking brake cable wire-form bracket bolts	17	-	150
Steering column brace-to-parking brake control bolt	12	-	106

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## **Parking Brake**

The parking brake and actuation system consists of the following components:

- Parking brake cables
- Parking brake control
- Parking brake shoes
- Red brake warning indicator

The parking brake system is a foot-operated/cable-actuated system that applies a drum-in-hat assembly within each rear brake disc. A red brake warning indicator is located in the instrument cluster and will illuminate when the system is actuated to alert the driver that the parking brakes are applied.

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## Parking Brake

### Principles of Operation

#### Parking Brake System

When the parking brake control is pressed, tension is applied to the front parking brake cable. This tension pulls on the LH rear parking brake cable, which is attached to the LH rear parking brake shoe actuator and applies the LH rear brake shoes. At the same time, the tension in the LH rear cable causes the LH rear cable conduit to attempt to straighten out. This straightening effect causes the LH rear cable conduit to pull on the RH rear parking brake cable, which is attached to the RH rear parking brake shoe actuator and applies the RH rear brake shoes.

### Inspection and Verification

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect the following mechanical and electrical components:

#### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"><li>• Parking brake control release handle</li><li>• Parking brake control</li><li>• Parking brake cables</li><li>• Parking brake shoes and hardware</li></ul>	<ul style="list-style-type: none"><li>• Wiring, terminals or connectors</li><li>• Parking brake switch</li></ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and GO to Symptom Chart .

### Symptom Chart

## Symptom Chart

## Pinpoint Tests

## Pinpoint Test A: The Parking Brake Does Not Apply


## Normal Operation

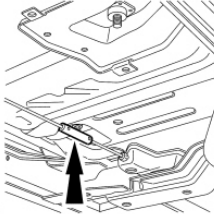
When the parking brake control pedal is pressed the pedal should move a short distance, with more pressure needed to apply the pedal as it gets closer to the floor, until the parking brake shoes are fully applied. When the pedal is pressed, tension is applied to the front parking brake cable. This tension pulls on the LH rear parking brake cable, which is attached to the LH rear parking brake shoe actuator and applies the LH rear brake shoes. At the same time, the tension in the LH rear cable causes the LH rear cable conduit to attempt to straighten out. This straightening effect causes the LH rear cable conduit to pull on the RH rear parking brake cable, which is attached to the RH rear parking brake shoe actuator and applies the RH rear brake shoes.


**This pinpoint test is intended to diagnose the following:**

- Rear parking brake cables and conduits
- Front parking brake cable and conduit
- Parking brake shoes and hardware
- Parking brake control

## PINPOINT TEST A: THE PARKING BRAKE DOES NOT APPLY

Test Step	Result / Action to Take
<b>A1 CHECK THE PARKING BRAKE CONTROL</b>	
<ul style="list-style-type: none"> <li>• Press the parking brake control pedal.</li> <li>• <b>Does the parking brake control pedal move?</b></li> </ul>	<b>Yes</b> GO to <u>A2</u> .  <b>No</b> GO to <u>A5</u> .
<b>A2 CHECK FOR BROKEN CABLES</b>	
<ul style="list-style-type: none"> <li>•  <b>WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <b>Section 100-02B</b> . Failure to follow the instructions may result in serious personal injury.</li> <li>• <b>NOTE:</b> Have an assistant press and release the parking brake pedal to help isolate disconnected cables or cables that do not move.</li> <li>• Inspect the following items for damage and correct connections:               <ul style="list-style-type: none"> <li>◆ Front cable and conduit</li> <li>◆ LH rear cable and conduit</li> <li>◆ RH rear cable and conduit</li> <li>◆ Rear cable brackets</li> </ul> </li> <li>• <b>Are the cables in good condition?</b></li> </ul>	<b>Yes</b> GO to <u>A3</u> .  <b>No</b> CONNECT the cable(s) or INSTALL new parking brake component(s) as necessary. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .
<b>A3 CHECK THE PARKING BRAKE SHOES,</b>	

<b>ACTUATOR LEVERS AND HARDWARE</b>	
<ul style="list-style-type: none"> <li>Remove the rear brake disc, refer to <u>Section 206-04</u> . Inspect the parking brake shoes, actuator levers and hardware.</li> <li><b>Are the parking brake shoes, actuator levers and hardware in good condition?</b></li> </ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> INSTALL new components as necessary. REFER to <u>Parking Brake Shoes</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .</p>
<b>A4 CHECK THE PARKING BRAKE SHOE ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>Check the parking brake shoe adjustment. Refer to <u>Parking Brake Shoe Adjustment</u> in this section.</li> <li><b>Are the parking brake shoes adjusted to specification?</b></li> </ul>	<p><b>Yes</b> INSTALL a new parking brake control. REFER to <u>Parking Brake Control</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .</p> <p><b>No</b> ADJUST the rear parking brake shoes. REFER to <u>Parking Brake Shoe Adjustment</u> in this section. If equipped with a fire suppression system, GO to <u>A8</u> .</p>
<b>A5 ISOLATE THE PARKING BRAKE CONTROL AND FRONT PARKING BRAKE CABLE</b>	
<ul style="list-style-type: none"> <li><b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</li> <li>Disconnect the front parking brake cable from the LH rear parking brake cable.</li> </ul>  <p>A0047694</p> <ul style="list-style-type: none"> <li>Press the parking brake control pedal.</li> <li><b>Does the parking brake control pedal move?</b></li> </ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> GO to <u>A7</u> .</p>
<b>A6 ISOLATE THE REAR PARKING BRAKE CABLES</b>	
<ul style="list-style-type: none"> <li>Disconnect the rear parking brake cables from the brake shoe actuator cables.</li> </ul>	<p><b>Yes</b> INSPECT the parking brake shoes, hardware and backing plate. INSTALL new components as necessary. REFER</p>

<ul style="list-style-type: none"> <li>• While holding the cable conduit, attempt to slide the cable inside the conduit.</li> <li>• <b>Does the cable slide freely inside the conduit?</b></li> </ul>	<p>to <u>Parking Brake Shoes</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .</p> <p><b>No</b> INSTALL new rear brake cable(s). REFER to <u>Parking Brake Cable - Rear</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .</p>
<b>A7 ISOLATE THE FRONT PARKING BRAKE CABLE</b>	
<ul style="list-style-type: none"> <li>• Disconnect the front parking brake cable and conduit from the parking brake control.</li> <li>• While holding the cable conduit, attempt to slide the cable inside the conduit.</li> <li>• <b>Does the cable slide freely inside the conduit?</b></li> </ul>	<p><b>Yes</b> INSTALL a new parking brake control. REFER to <u>Parking Brake Control</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .</p> <p><b>No</b> INSTALL a new front parking brake cable. REFER to <u>Parking Brake Cable - Front</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>A8</u> .</p>
<b>A8 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>•  <b>WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</b></li> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> .</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for fire suppression system depowering and repowering procedure.</p>

## Pinpoint Test B: The Parking Brake Will Not Release and/or Parking Brake Shoe Drag

### Normal Operation

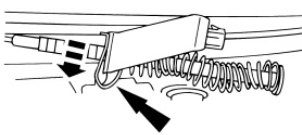
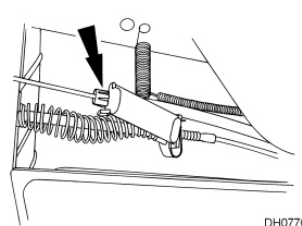
When the parking brake release handle is pulled, the ratchet mechanism and return spring in the parking brake control release the tension on the parking brake cables and conduits. The LH rear parking brake cable conduit and the springs on both rear cables provide the force necessary to return the parking brake shoes to their released position.

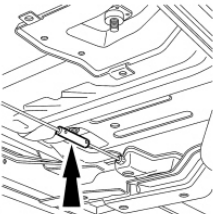
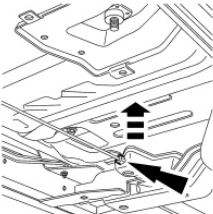
**This pinpoint test is intended to diagnose the following:**

- Parking brake control release handle
- Front parking brake cable and conduit
- Rear parking brake cable and conduit
- Parking brake shoes and hardware

- Parking brake control

**PINPOINT TEST B: THE PARKING BRAKE WILL NOT RELEASE AND/OR PARKING BRAKE SHOE DRAG**

Test Step	Result / Action to Take
<b>B1 CHECK THE PARKING BRAKE CONTROL RELEASE HANDLE</b>	
<ul style="list-style-type: none"> <li>• Verify that the release handle is connected to the parking brake control.</li> <li>• <b>Is the release handle connected?</b></li> </ul>	<p><b>Yes</b> GO to <b>B2</b> .</p> <p><b>No</b> CONNECT the handle and TEST the system for normal operation.</p>
<b>B2 CHECK THE REAR PARKING BRAKE CABLES</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <b>Section 100-02B</b> . Failure to follow the instructions may result in serious personal injury.</li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <b>Section 100-02A</b> .</li> <li>• Pull the parking brake adjuster clip downward.</li> </ul>  <p style="text-align: center;">AH0064-A</p> <ul style="list-style-type: none"> <li>• Disconnect the LH rear parking brake cable and conduit from the cable adjuster.</li> </ul>  <p style="text-align: center;">DH0770-A</p> <ul style="list-style-type: none"> <li>• Disconnect the front parking brake cable from the LH rear parking brake cable.</li> </ul>	<p><b>Yes</b> GO to <b>B3</b> .</p> <p><b>No</b> INSTALL a new rear cable. REFER to <b>Parking Brake Cable - Rear</b> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <b>B5</b> .</p>

 <p>A0047694</p> <ul style="list-style-type: none"> <li>• Disconnect both rear parking brake cables from the parking brake cable extensions at the wheel ends.</li> <li>• While holding the rear cable conduit, attempt to slide the rear cable inside the conduit.</li> <li>• <b>Does the cable slide freely inside the conduit?</b></li> </ul>	
<b>B3 CHECK THE REAR PARKING BRAKE SHOES AND HARDWARE</b>	
<ul style="list-style-type: none"> <li>• Remove the rear brake disc, refer to <a href="#">Section 206-04</a>.</li> <li>• Inspect the parking brake shoes, hardware and backing plate.</li> <li>• <b>Are the shoes, hardware and backing plate in good condition?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">B4</a>.</p> <p><b>No</b> INSTALL new components as necessary. TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">B5</a>.</p>
<b>B4 ISOLATE THE FRONT PARKING BRAKE CABLE</b>	
<ul style="list-style-type: none"> <li>• Press the retaining tabs and remove the front parking brake conduit from the frame bracket.</li> </ul>  <p>A0047030</p> <ul style="list-style-type: none"> <li>• Remove the front parking brake cable bracket bolt. <ul style="list-style-type: none"> <li>♦ To install, tighten to 12 Nm (106 lb-in).</li> </ul> </li> <li>• Press the retaining tabs and disconnect the front parking brake conduit from the parking brake control bracket.</li> <li>• Push the front parking brake conduit grommet through the body.</li> <li>• Verify that the front cable conduit can slide freely on the cable.</li> <li>• <b>Does the conduit slide freely on the cable?</b></li> </ul>	<p><b>Yes</b> INSTALL a new parking brake control. REFER to <a href="#">Parking Brake Control</a> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">B5</a>.</p> <p><b>No</b> INSTALL a new front cable. REFER to <a href="#">Parking Brake Cable - Front</a> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <a href="#">B5</a>.</p>
<b>B5 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <a href="#">Section 100-02B</a>. Failure to follow the instructions may result in serious personal injury.</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <a href="#">Section 100-02B</a> for fire suppression system depowering and</p>

- |  |                       |
|--|-----------------------|
| <ul style="list-style-type: none"><li>• Verify that the fire suppression system is repowered.<br/>Refer to <u>Section 100-02B</u> .</li><li>• <b>Is the fire suppression system repowered?</b></li></ul> | repowering procedure. |
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**Parking Brake Cable Adjustment**

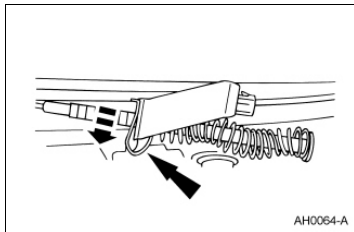
1. **NOTE:** Make sure the parking brake is fully released.

Using the parking brake release handle, release the parking brake control.

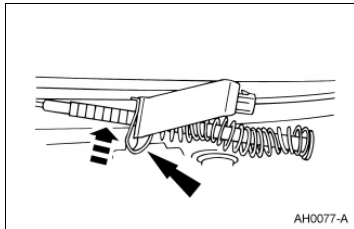
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

3. Pull the parking brake cable adjuster clip downward. The tensioner spring will take up the cable slack and preload the cables.



4. Push upward on the bottom of the clip to lock the adjustment. If the clip does not slide upward, move the assembly slightly to align the closest groove on the parking brake cable adjuster rod with the clip.



5. **NOTE:** If new cables are installed, allow 20 minutes prior to releasing the parking brake control.

Apply the parking brake control fully and release using the parking brake release handle.

6. Repeat Steps 4 and 5 to complete the adjustment procedure.

7. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.





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**Parking Brake Shoe Adjustment**

1. **NOTE:** Make sure the parking brake is fully released.

Using the release handle, release the parking brake control.

2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

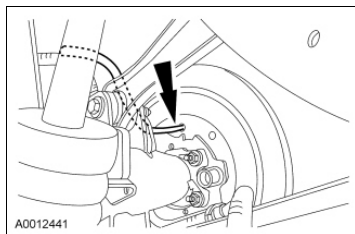
3. **NOTICE:** Do not allow the brake caliper and brake pads to hang from the brake hose or damage to the hose may occur.

Remove the 2 brake caliper guide pin bolts and position the caliper and brake pads aside.

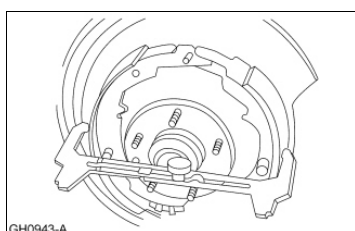
- Support the caliper using mechanic's wire.


4. **NOTE:** If the brake disc binds on the rear parking brake shoes, remove the adjustment hole access plug and retract the parking brake shoes using an adjusting tool.

Insert the tool at the end of the access plug slot farthest from the brake caliper. Engage the adjuster and rotate by raising the end of the tool toward the backing plate. Remove the brake disc.



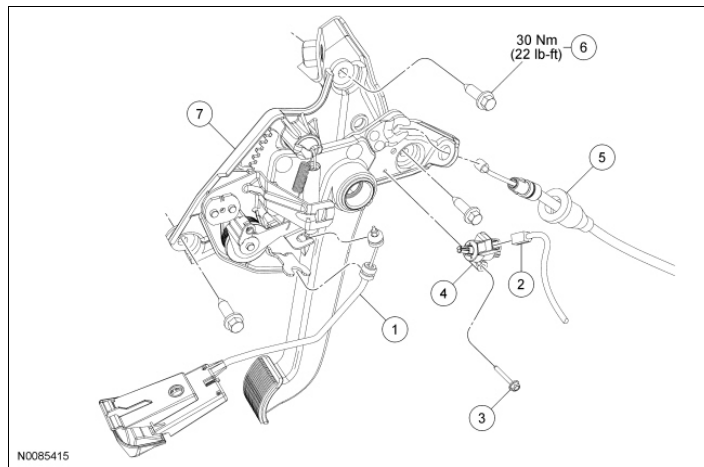
5. Inspect the parking brake shoes and drum for wear, damage or oil contamination. Install new components as necessary.
  - If the linings are oil contaminated, install a new rear axle oil seal. For additional information, refer to [Section 205-02](#) .
6. Using a suitable brake adjusting gauge, measure the inside diameter of the drum portion of the rear brake disc. Record the measurement.
7. Using a suitable brake adjusting gauge, set the rear brake shoe and lining diameter to 0.5 mm (0.020 in) less than the inside diameter of the drum portion of the rear brake disc.



8. Position the brake disc onto the hub.
9. Position the brake caliper and brake pads onto the anchor plate and install the 2 brake caliper guide pin bolts.
  - Tighten to 25 Nm (18 lb-ft).
10. Test the parking brake for normal operation.
11.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Parking Brake Control**

Item	Part Number	Description
1	2B658	Parking brake release handle
2	-	Parking brake switch electrical connector (part of 14401)
3	-	Parking brake switch bolt (part of 15A851)
4	15A851	Parking brake switch
5	2853	Front parking brake cable
6	N806730	Parking brake control bolt (3 required)
7	2780	Parking brake control

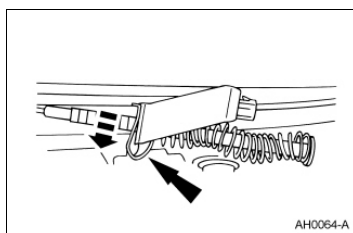
**Removal and Installation**

**NOTE:** Column shift shown, floor shift similar.

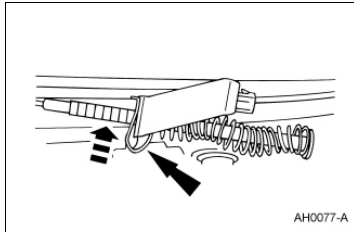
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information refer to [Section 100-02A](#).

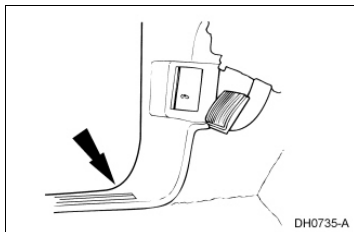
2. Using the parking brake release handle, release the parking brake control.
3. Pull the parking brake adjuster clip downward.



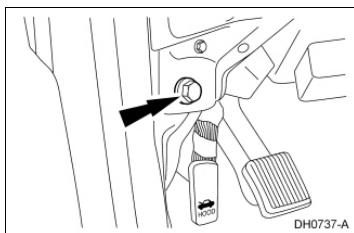
4. Apply the parking brake control fully.
5. Push upward on the parking brake adjuster clip to lock the adjuster.



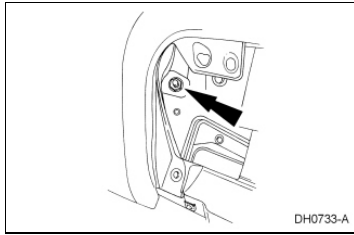
6. Using the parking brake release handle, release the parking brake control.
7. Disconnect the front parking brake cable and conduit from the cable union.
8. Unclip the scuff plate, the cowl side trim panel and remove.



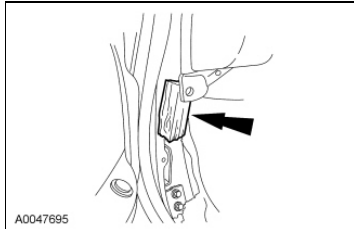
9. Disconnect the parking brake release handle cable from the parking brake control.
10. Remove the instrument panel steering column opening cover reinforcement. For additional information, refer to the instrument panel exploded view in [Section 501-12](#).
11. Loosen the PCM wiring connector bolt and disconnect the connector.
12. Loosen the bulkhead wiring connector retaining bolt and disconnect the connector.
  - Position the bulkhead wiring connector aside for access.
  - Push the instrument panel side of the bulkhead wiring connector into the passenger compartment.
13. Remove the steering column brace-to-parking brake control bolt.
  - To install, tighten to 12 Nm (106 lb-in).
14. Remove the instrument panel cowl side bolt.
  - To install, tighten to 50 Nm (37 lb-ft).



15. Remove the instrument panel cowl side nut.
  - To install, tighten to 55 Nm (41 lb-ft).



16. Pull the instrument panel slightly rearward and retain it using a small block of wood.

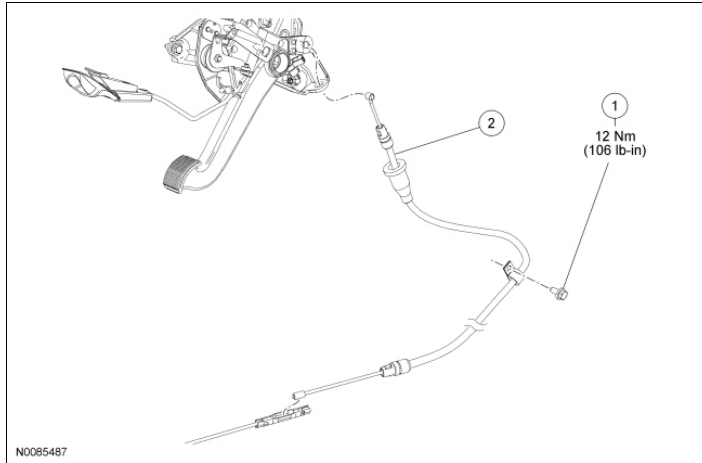


17. Disconnect the parking brake switch electrical connector.
18. Disconnect the front parking brake cable and conduit from the parking brake control.
19. Remove the 3 parking brake control bolts.
  - To install, tighten to 30 Nm (22 lb-ft).
20. Remove the parking brake control.
21. To install, reverse the removal procedure.
  - Adjust the parking brake cable tension. For additional information, refer to Parking Brake Cable Adjustment in this section.
22. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Parking Brake Cable - Front**

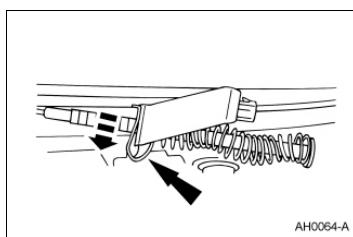
Item	Part Number	Description
1	W704901	Front parking brake cable bracket bolt
2	2853	Front parking brake cable

**Removal and Installation**

1. Using the parking brake release handle, release the parking brake control.
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

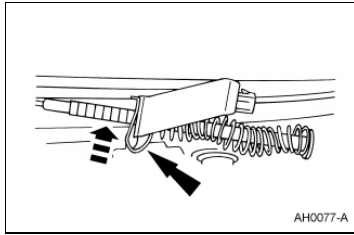
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

3. Pull the parking brake adjuster clip downward.

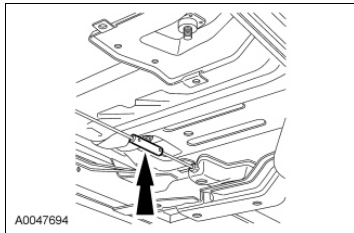


4. Apply the parking brake control fully.
5. Push upward on the parking brake adjuster clip to lock the adjuster.

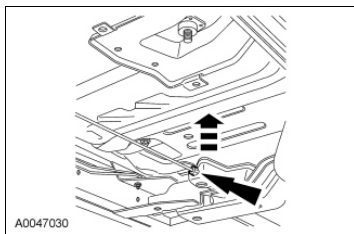




6. Using the parking brake release handle, release the parking brake control.
7. Disconnect the front parking brake cable from the LH rear parking brake cable at the cable union.



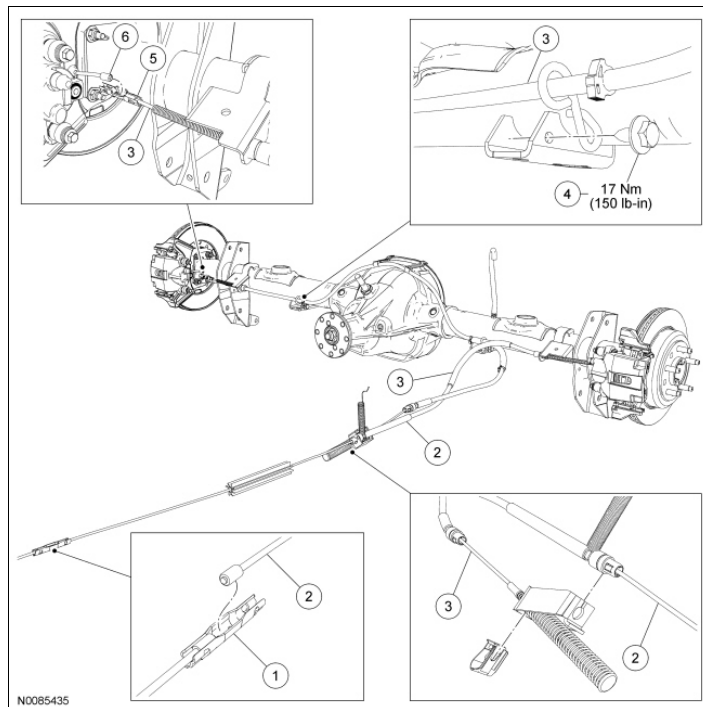
8. Press the retaining tabs and remove the front parking brake conduit from the frame bracket.



9. Press the retaining tabs and disconnect the front parking brake cable conduit from the parking brake control bracket.
10. Remove the front parking brake cable bracket bolt.
  - To install, tighten to 12 Nm (106 lb-in).
11. Disconnect the front parking brake cable from the parking brake control.
12. Push the front parking brake conduit grommet through the body and remove the front parking brake cable.
13. To install, reverse the removal procedure.
  - Adjust the parking brake cable tension. For additional information, refer to Parking Brake Cable Adjustment in this section.
14. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.



**Parking Brake Cable - Rear**

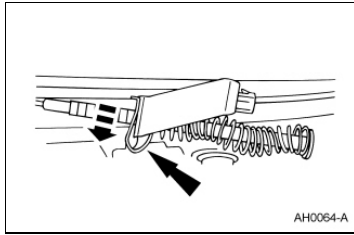
Item	Part Number	Description
1	-	Front parking brake cable-to-LH rear parking brake cable union (part of 2A635)
2	2A635	LH rear parking brake cable
3	2A635	RH rear parking brake cable
4	N802212	RH rear parking brake cable wire-form bracket bolt (2 required)
5	-	Rear parking brake cable-to-rear parking brake cable extension union (part of 2A815)
6	2A815	Rear parking brake cable extension

**Removal and Installation**

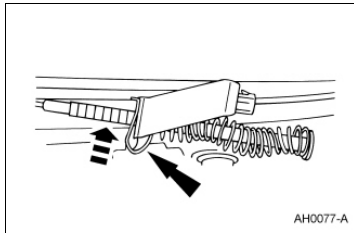
1. Using the parking brake release handle, release the parking brake control.
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

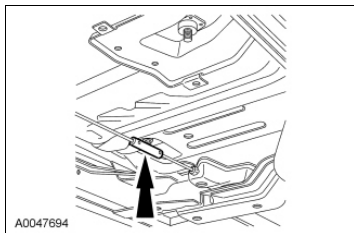
3. Pull the parking brake adjuster clip downward.



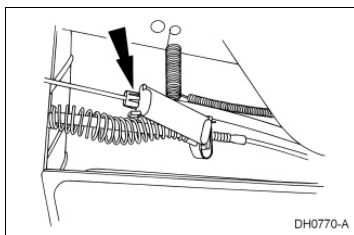
4. Apply the parking brake control fully.
5. Push upward on the parking brake adjuster clip to lock the adjuster.




6. Using the parking brake release handle, release the parking brake control.
7. Disconnect the front parking brake cable from the LH rear parking brake cable at the cable union.



8. Disconnect the LH rear parking brake conduit from the cable adjuster.



9. Disconnect the LH rear parking brake cable from the LH rear parking brake cable extension union and remove the LH rear parking brake cable and conduit.
10. Press the retaining tabs and disconnect the RH rear parking brake cable and conduit from the frame bracket.
11. Remove the RH rear parking brake cable wire-form bracket bolts.
  - To install, tighten to 17 Nm (150 lb-in).
12. Disconnect the RH rear parking brake cable and conduit from the axle housing clips.
13. Disconnect the RH rear parking brake cable from the RH rear parking brake cable extension union and remove the RH rear parking brake cable and conduit.

14. To install, reverse the removal procedure.
  - Adjust the cable tension. For additional information, refer to Parking Brake Cable Adjustment in this section.
15.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

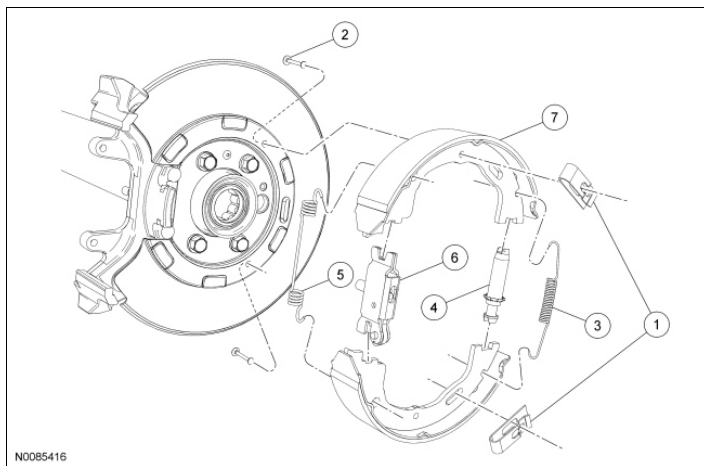
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**Parking Brake Shoes**

## Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A

**NOTE:** Wheel hub removed for clarity.




Item	Part Number	Description
1	-	Parking brake shoe hold-down springs (part of 2A225)
2	-	Parking brake shoe hold-down spring anchor (part of 2A225) (2 required)
3	-	Parking brake shoe adjusting spring (part of 2A225)
4	-	Parking brake adjuster (part of 2A225)
5	-	Parking brake shoe return spring (part of 2A225)
6	-	Parking brake actuator (part of 2A225)
7	2N712	Parking brake shoe (2 required)

**Removal and Installation**

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

Remove the brake disc. For additional information, refer to [Section 206-04](#) .

2. Remove the adjuster by removing the brake shoe return spring and the adjusting spring.
  - A sharp-pointed tool such as a scratch awl is useful in removing and installing the springs.

3. Remove the parking brake actuator.
  - Push the parking brake shoes toward each other then pull the parking brake actuator out. Unhook the parking brake cable end.
4. Remove the brake shoe hold-down springs.
5. Remove the parking brake shoes.
6. Inspect the components for excessive wear or damage and install new components as necessary.
7. To install, reverse the removal procedure.
  - Using the specified anti-seize lubricant, lubricate the brake shoe contact point before installation of the rear brake shoes.
  - Lubricate the adjusting screw threads with the specified anti-seize lubricant.
  - Adjust the parking brake shoes. For additional information, refer to Parking Brake Shoe Adjustment in this section.
  - Adjust the parking brake cable tension. For additional information, refer to Parking Brake Cable Adjustment in this section.
8.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

## Material

Item	Specification	Fill Capacity
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	780 ml (1.6 pt)

## Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder nuts	23	17	-
Brake pedal bracket bolt	30	22	-
Brake pedal bracket nuts	28	21	-
Brake tube fittings <sup>a</sup>	17	-	150
Steering column shaft bolt	30	22	-

<sup>a</sup> All brake tube fittings must be tightened to the specific torque value and be free of fluid leakage.

---



## Hydraulic Brake Actuation

### Hydraulic Brake Actuation

The hydraulic brake actuation system consists of the following components:

- Brake master cylinder and fluid reservoir
- Brake tubes and hoses
- Brake pedal and bracket
- Hydraulic Control Unit (HCU)

The brake pedal is connected to the power brake booster, which is connected to the brake master cylinder. When the brake pedal is pressed, brake fluid is forced through the brake tubes and flexible hoses to the HCU . The brake fluid is then distributed to the front and rear brake calipers. The fluid enters the caliper, forcing the caliper pistons and brake pads outward against the brake disc friction surface. When the brake pedal is released, brake fluid pressure is relieved, returning the front and rear brake caliper pistons and brake pads to the unapplied position.

For information on the HCU , refer to Section 206-09 .

### Adjustable Pedals

Adjustable brake and accelerator pedals are available as an optional feature on this vehicle. The brake pedal position can be changed in phase with the accelerator pedal to increase driver comfort. The adjustable pedal system consists of the following components:

- Adjustable brake pedal and bracket
- Adjustable accelerator pedal and bracket, refer to Section 310-02
- Adjustable pedal switch
- Adjustable pedal motor
- Adjustable pedal cable

The pedals are adjusted through the use of a rocker switch mounted on the instrument panel. One end of the motor is connected directly to the accelerator pedal and the other end is connected to the brake pedal through a cable and worm gear. When the motor is energized, both the motor and the cable spin to adjust the pedals either forward (away from the driver) or rearward (toward the driver) depending on how the switch is pressed.

---



## **Principles of Operation**

### **Hydraulic Brakes**

To diagnose hydraulic brake concerns, refer to Section 206-00 .

### **Adjustable Pedals**

The adjustable pedals are controlled directly by the adjustable pedal switch. When the adjustable pedal switch is pressed, voltage is sent to the motor. The adjustable pedal motor is attached to the RH side of the accelerator pedal assembly and controls the accelerator pedal directly. The motor controls the brake pedal through the use of a cable contained inside a sleeve and a worm gear set. The adjustable pedal motor can operate in both directions, forward or rearward, depending on which direction the switch is pressed. The motor spins the cable inside the sleeve, the cable spins the worm gear set attached to the brake pedal and the pedals move. The pedals can be adjusted with the ignition switch in the OFF, ACC or RUN position.

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**Inspection And Verification**

1. Verify the customer concern by operating the adjustable pedal.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"><li>• Adjustable pedal assembly</li><li>• Adjustable pedal cable</li><li>• Adjustable pedal switch</li></ul>	<ul style="list-style-type: none"><li>• Central Junction Box (CJB) fuse 14 (15A)</li><li>• Wiring, terminals or connectors</li></ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
  4. If the cause is not visually evident, GO to Symptom Chart .
-



## Symptom Chart

Symptom Chart

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**Pinpoint Test**

## Special Tool(s)

 ST2574-A	Flex Probe Kit 105-R025D or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent

**Pinpoint Test A: Adjustable Brake Pedal is Inoperative/Does Not Operate Correctly**

Refer to Wiring Diagrams Cell 127 , Adjustable Pedal for schematic and connector information.

**Normal Operation**

Central Junction Box (CJB) fuse 14 (15A) provides fused battery voltage to the adjustable pedal switch along circuit 1567 (RD/LG). The adjustable pedal switch distributes this voltage to the adjustable pedal motor along circuits 1494 (RD) and 1495 (WH) depending on switch position.

To move the pedals forward (away from the driver), the voltage is sent from the switch to the adjustable pedal motor along circuit 1494 (RD), the voltage returns from the motor to the switch along circuit 1495 (WH) and is grounded through the switch along circuit 57 (BK).

To move the pedals rearward (towards the driver), the voltage is sent from the switch to the adjustable pedal motor along circuit 1495 (WH), the voltage returns from the motor to the switch along circuit 1494 (RD) and is grounded through the switch along circuit 57 (BK).


**This pinpoint test is intended to diagnose the following:**

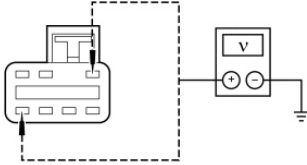
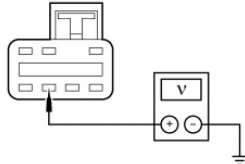
- Fuse
- Wiring, terminals or connectors
- Foreign material
- Adjustable pedal cable(s)
- Adjustable pedal switch
- Adjustable pedal motor
- Adjustable pedal assembly
- Adjustable accelerator pedal assembly

**PINPOINT TEST A: ADJUSTABLE BRAKE PEDAL IS INOPERATIVE/DOES NOT OPERATE CORRECTLY**

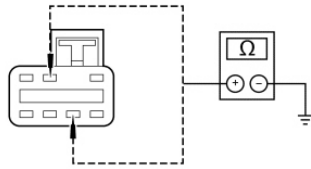
**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
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<b>A1 CHECK THE ADJUSTABLE PEDAL MOTOR FOR SOUND</b>	
<ul style="list-style-type: none"> <li>• Allow 2 minutes for the thermal overload to reset.</li> <li>• Operate the adjustable pedal control switch.</li> <li>• <b>Can the adjustable pedal motor be heard to operate?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> GO to <u>A6</u> .</p>
<b>A2 CHECK THE ADJUSTABLE PEDAL MOTOR INSTALLATION</b>	
<ul style="list-style-type: none"> <li>• Check adjustable pedal motor for correct installation.</li> <li>• <b>Is the motor installed correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> CORRECT the motor installation. TEST the system for normal operation.</p>
<b>A3 CHECK THE ADJUSTABLE ACCELERATOR PEDAL SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Disconnect the adjustable pedal cable from the brake pedal drive.</li> </ul>  <p>A0026998</p> <ul style="list-style-type: none"> <li>• Operate the adjustable pedal control switch.</li> <li>• <b>Does the adjustable pedal motor operate now?</b></li> </ul>	<p><b>Yes</b> INSPECT the adjustable pedal assembly for any foreign material. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p>If no foreign material is found, INSTALL a new adjustable brake pedal assembly. REFER to <u>Brake Pedal and Bracket</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A4</u> .</p>
<b>A4 INSPECT THE ACCELERATOR PEDAL ASSEMBLY FOR FOREIGN MATERIAL</b>	
<ul style="list-style-type: none"> <li>• Inspect the adjustable accelerator pedal assembly for foreign material causing a binding condition.</li> <li>• <b>Was any foreign material found?</b></li> </ul>	<p><b>Yes</b> REMOVE the foreign material. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A5</u> .</p>
<b>A5 CHECK THE ADJUSTABLE BRAKE PEDAL CABLE</b>	
<ul style="list-style-type: none"> <li>• Disconnect the adjustable pedal cable from the motor.</li> <li>• Inspect the ends of the adjustable pedal cable for wear or damage.</li> <li>• <b>Are the cable ends OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> INSTALL a new accelerator pedal and bracket. REFER to <u>Section 310-02</u> . TEST the system for normal operation.</p>

<b>A6 CHECK CIRCUITS 1495 (WH) AND 1494 (RD) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Adjustable Pedal Switch C2089.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and:             <ul style="list-style-type: none"> <li>♦ adjustable pedal switch C2089-1, circuit 1495 (WH), harness side.</li> <li>♦ adjustable pedal switch C2089-7, circuit 1494 (RD), harness side.</li> </ul> </li> </ul>  <p>A0013399</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the affected circuit(s). TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A7</u> .</p>
<b>A7 CHECK FOR VOLTAGE TO THE ADJUSTABLE PEDAL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between adjustable pedal switch C2089-2, circuit 1567 (RD/LG), harness side and ground.</li> </ul>  <p>A0013396</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A8</u> .</p> <p><b>No</b> VERIFY CJB fuse 14 (15A) is OK. If OK, REPAIR circuit 1567 (RD/LG). TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.</p>
<b>A8 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and:             <ul style="list-style-type: none"> <li>♦ adjustable pedal switch C2089-3, circuit 57 (BK), harness side.</li> <li>♦ adjustable pedal switch C2089-6, circuit 57 (BK), harness side.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>A9</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK). TEST the system for normal operation.</p>



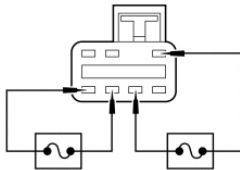


A0013397

- Are the resistances less than 5 ohms?

#### **A9 TEST THE ADJUSTABLE PEDAL MOTOR REARWARD CIRCUIT**

- Connect fused jumper wires between:
  - ♦ adjustable pedal switch C2089-1, circuit 1495 (WH), harness side and adjustable pedal switch C2089-2, circuit 1567 (RD/LG), harness side.
  - ♦ adjustable pedal switch C2089-7, circuit 1494 (RD), harness side and adjustable pedal switch C2089-3, circuit 57 (BK), harness side.



A0013398

- Do the adjustable pedals move rearward?

**Yes**GO to A10 .**No**GO to A11 .

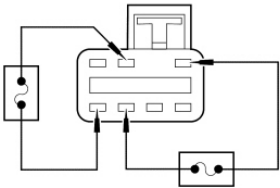
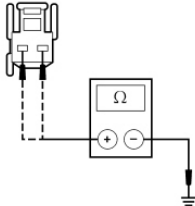
#### **A10 TEST THE ADJUSTABLE PEDAL MOTOR FORWARD CIRCUIT**

- Connect fused jumper wires between:
  - ♦ adjustable pedal switch C2089-7, circuit 1494 (RD), harness side and adjustable pedal switch C2089-2, circuit 1567 (RD/LG), harness side.
  - ♦ adjustable pedal switch C2089-1, circuit 1495 (WH), harness side and adjustable pedal switch C2089-6, circuit 57 (BK), harness side.

**Yes**

INSTALL a new adjustable pedal switch. TEST the system for normal operation.

**No**GO to A11 .

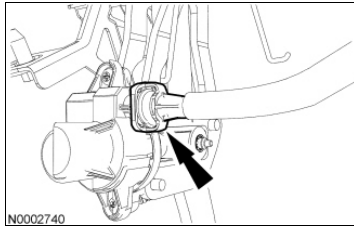
<div><p>N0047394</p><p>• Do the adjustable pedals move forward?</p></div>	
<div><p><b>A11 CHECK CIRCUITS 1495 (WH) AND 1494 (RD) FOR AN OPEN</b></p><ul style="list-style-type: none"><li>• Connect: Adjustable Pedal Switch C2089.</li><li>• Disconnect: Adjustable Pedal Motor C2003.</li><li>• Measure resistance between ground and:<ul style="list-style-type: none"><li>♦ adjustable pedal motor C2003-1, circuit 1495 (WH), harness side.</li><li>♦ adjustable pedal motor C2003-2, circuit 1494 (RD), harness side.</li></ul></li></ul></div>	
<div><div><p>N0025883</p></div><p>• Are the resistances less than 5 ohms?</p></div>	<div><p><b>Yes</b> INSTALL a new accelerator pedal and bracket. REFER to <u>Section 310-02</u> . TEST the system for normal operation.</p><p><b>No</b> REPAIR the affected circuit(s). TEST the system for normal operation.</p></div>

## Adjustable Pedal Indexing

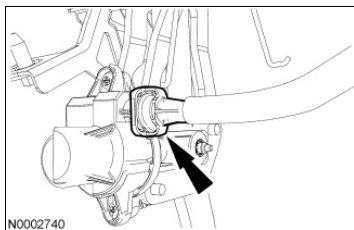
**NOTICE:** The adjustable pedal system must be indexed whenever the brake pedal assembly or the accelerator pedal assembly is repaired or component damage may occur.

1. **NOTE:** Make sure the electrical connector is connected to the adjustable pedal motor.

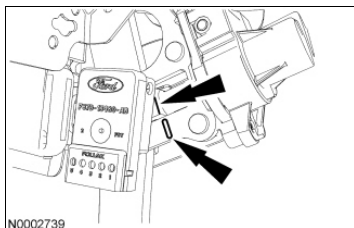
Disconnect the adjustable pedal motor drive cable from the brake pedal drive.



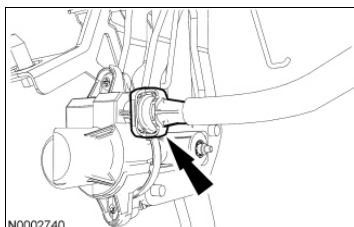
2. Operate the accelerator pedal to the full rearward position.
3. Connect the adjustable pedal motor drive cable to the adjustable brake pedal drive.



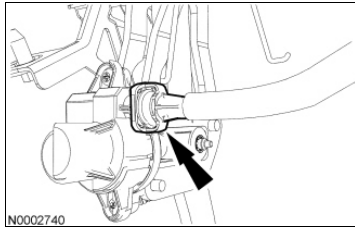
4. Operate the adjustable pedal motor to align the adjustable brake pedal indexing marks.



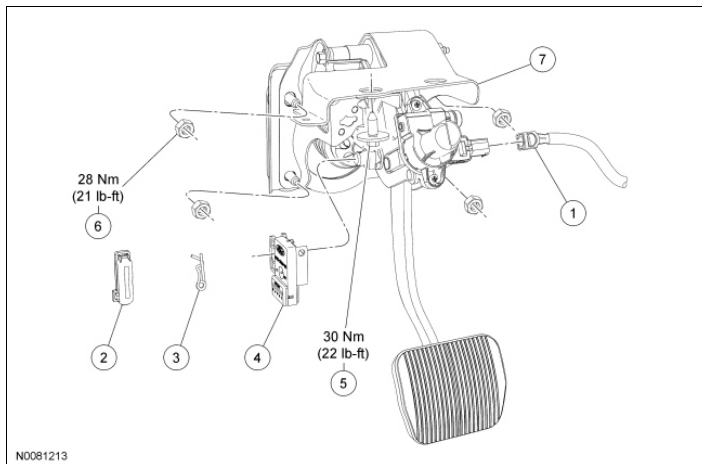
5. Disconnect the adjustable pedal motor drive cable from the adjustable brake pedal assembly.



6. Operate the adjustable accelerator pedal to the full forward position.
7. Connect the adjustable pedal motor drive cable to the adjustable brake pedal drive.



8. Check that the brake and accelerator pedals can adjust at least 50 mm (1.96 in) from the base position.
-

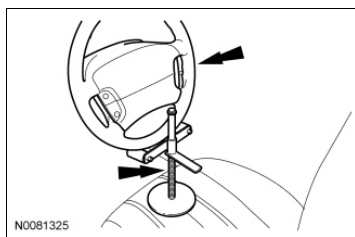
**Brake Pedal and Bracket**

Item	Part Number	Description
1	2C430	Adjustable pedal motor drive cable
2	2475	Booster push rod retaining pin cover
3	380699	Booster push rod retaining pin
4	13480	Stoplamp switch
5	N811148	Brake pedal bracket bolt
6	385759	Brake pedal bracket nut (4 required)
7	2450	Brake pedal and bracket

**Removal and Installation**

- NOTE:** Use a steering wheel holding device (such as Hunter® 28-75-1 or equivalent).

Using a suitable holding device, hold the steering wheel in the straight-ahead position.



- Remove the instrument panel close-out panel.
  - Remove the pushpins.
  - Turn the lamp counterclockwise.
- NOTICE:** Do not service the brake pedal or brake booster without first removing the speed control deactivator switch. This switch must be removed with the brake pedal in the at-rest position. Switch plungers must be compressed for the switch to rotate in the bracket. Attempting to remove the switch when the plunger is extended (during pedal apply) will result in damage to the switch.

Remove the speed control deactivator switch. For additional information, refer to [Section 419-03](#).

4. Remove the booster push rod retaining pin cover.
5. Remove the booster push rod retaining pin.
6. Slide the stoplight switch, the washer, bushing and booster push rod from the brake pedal pin.
7. Remove the brake pedal bracket bolt.
  - To install, tighten to 30 Nm (22 lb-ft).
8. Detach the adjustable brake pedal drive cable from the brake pedal assembly.
9. Disconnect the stoplight switch harness from the pedal bracket.
10. **NOTICE: Do not allow the steering column shaft to rotate while the lower shaft is disconnected or damage to the clockspring may result. If there is evidence that the shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.**

Remove the steering column shaft bolt and disconnect the steering column shaft from the steering column.

- Discard the bolt.
  - To install, tighten the new bolt to 30 Nm (22 lb-ft).
11. Remove the 4 brake pedal bracket nuts and brake pedal and bracket.
    - To install, tighten to 28 Nm (21 lb-ft).
  12. **NOTICE: The brake switch must be positioned with the closed hole away from the brake pedal arm and the open hole toward the brake pedal arm or damage to the switch may occur.**

**NOTICE: Do not press, pull or otherwise move the brake pedal while installing the speed control deactivator switch. This switch must be installed with the booster push rod attached to the brake pedal and with the brake pedal in the at-rest position. Installing this switch with the brake pedal in any other position will result in incorrect adjustment and may damage the switch.**

To install, reverse the removal procedure.

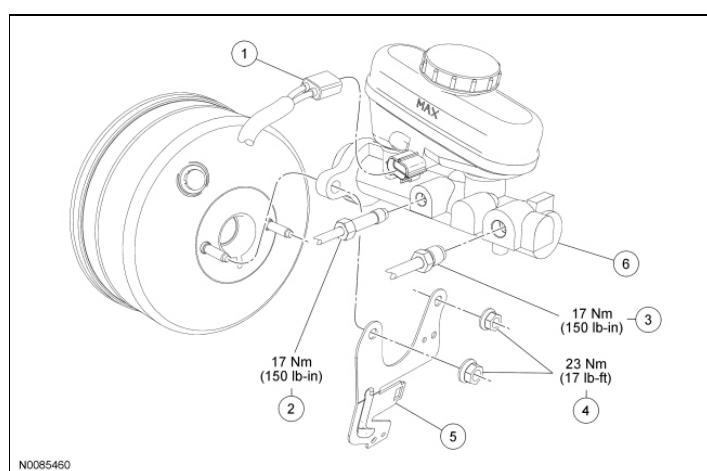
- Verify correct stoplight operation.
-



**Brake Master Cylinder**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	-	Brake fluid level switch connector (part of 14290)
2	-	Primary brake tube fitting (part of 2C296)
3	-	Secondary brake tube fitting (part of 2C296)
4	382802	Brake master cylinder nuts
5	14536	Wiring harness bracket
6	2140	Brake master cylinder

**Removal and Installation**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

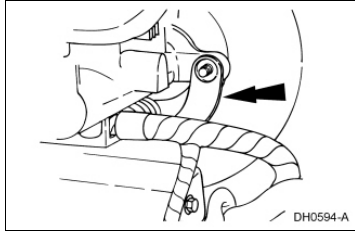
**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

1. Disconnect the brake tube fittings from the master cylinder.
  - To install, tighten to 17 Nm (150 lb-in).



2. Disconnect the brake fluid level switch connector.
3. Remove the 2 brake master cylinder nuts.
  - To install, tighten to 23 Nm (17 lb-ft).
4. Remove the wiring harness bracket and position aside.

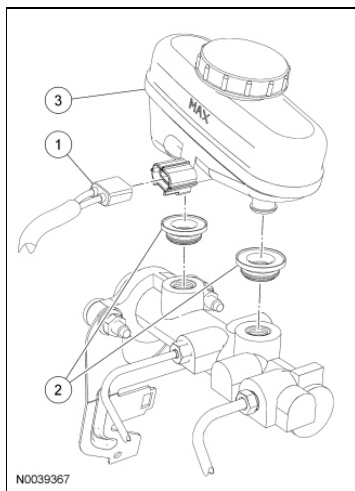


5. Remove the brake master cylinder.
  6. To install, reverse the removal procedure.
    - Bleed the master cylinder. For additional information, refer to Component Bleeding in Section 206-00 .
-

**Brake Fluid Reservoir**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	-	Brake fluid level switch electrical connector (part of 14290)
2	-	Brake fluid reservoir grommets (part of 2K478) (2 required)
3	2K478	Brake fluid reservoir

**Removal and Installation**

**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

1. Disconnect the brake fluid level switch electrical connector.
2. Pull upward on the brake master cylinder reservoir to remove.

3. **NOTE:** Whenever installing a brake master cylinder reservoir, install new grommets.

Remove the 2 brake fluid reservoir grommets.

- To install, lubricate the 2 grommets with the specified brake fluid.
4. To install, reverse the removal procedure.
- Press the brake master cylinder reservoir into the grommets until it is fully seated.
-

**Torque Specifications**

Description	Nm	lb-ft
Brake master cylinder nuts	23	17
Brake pedal bracket nuts	28	21

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**Brake Booster**

The power brake actuation system consists of the following components:

- Brake booster
- Brake booster check valve
- Brake booster vacuum supply hose

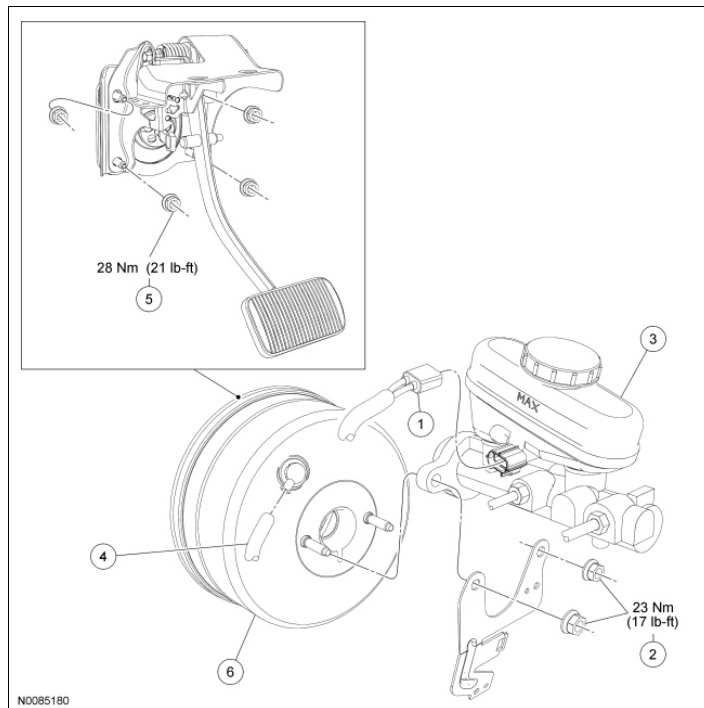
The brake booster uses engine vacuum from the intake manifold to create a partial vacuum inside the vacuum booster on both sides of the diaphragm. When the brake pedal is pressed, the booster rod opens a valve, allowing air to enter the booster on one side of the diaphragm while sealing off the opposite side. This increases pressure on that side of the diaphragm so that it helps push the rod, which in turn pushes the piston in the master cylinder. As the brake pedal is released, the valve seals off the outside air supply while opening the vacuum valve. This restores vacuum to both sides of the diaphragm, allowing everything to return to its original position.

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## **Power Brake System**

Refer to Section 206-00 .

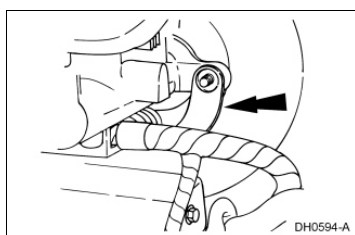
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**Brake Booster**

Item	Part Number	Description
1	-	Brake fluid level sensor electrical connector (part of 14401)
2	382802	Brake master cylinder nuts
3	2140	Brake master cylinder
4	2365	Brake booster vacuum hose
5	385759	Brake pedal bracket nut (4 required)
6	2005	Brake booster

**Removal and Installation**

1. Disconnect the brake fluid level sensor electrical connector.
2. Disconnect the brake booster check valve.
3. Remove the 2 brake master cylinder nuts.
  - To install, tighten to 23 Nm (17 lb-ft).
4. Disconnect the wiring harness bracket and position it aside.



5. Pull the brake master cylinder forward and position it aside.
6. Remove the instrument panel steering column cover. For additional information, refer to Instrument Panel Exploded View in Section 501-12 .
7. **NOTICE: Do not service the brake pedal or brake booster without first removing the stoplamp switch and speed control deactivator switch. These switches must be removed with the brake pedal in the at-rest position. Switch plungers must be compressed for the switch to rotate in the bracket. Attempting to remove the switch when the plunger is extended (during pedal apply) will result in damage to the switch.**

Remove the stoplamp switch. For additional information, refer to Section 417-01 .

8. If equipped, remove the speed control deactivator switch. For additional information, refer to Section 419-03 .
9. Remove the brake booster push rod retaining pin cover, retaining pin, washer, bushing and switch.
  - Slide the booster push rod off the pedal pin.
10. Remove the 4 brake pedal bracket nuts and the power brake booster.
  - To install, tighten to 28 Nm (21 lb-ft).
11. **NOTICE: Do not press, pull or otherwise move the brake pedal while installing the stoplamp switch or the speed control deactivator switch. These switches must be installed with the booster push rod attached to the brake pedal and with the brake pedal in the at-rest position. Installing these switches with the brake pedal in any other position will result in incorrect adjustment and may damage the switches.**

**NOTE:** The brake booster input rod must be correctly oriented during installation.

To install, reverse the removal procedure.

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## Material

Item	Specification	Fill Capacity
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1	527 ml (1.1 pt)

## Torque Specifications

Description	Nm	lb-in
ABS module screws	3	27
Brake tube-to-Hydraulic Control Unit (HCU) fittings	18	159
HCU -to-mounting bracket nuts	9	80
Rear wheel speed sensor bolt	7	62

## Anti-Lock Control

### ABS with Engine Only Traction Control (EOTC)

The anti-lock control system consists of the following components:

- ABS module - attached to the Hydraulic Control Unit (HCU), but can be serviced separately.
- Front wheel speed sensors - one sensor is located in each wheel bearing and wheel hub assembly and is serviced with the wheel bearing and wheel hub. For front wheel bearing and wheel hub removal and installation information, refer to Section 204-01 .
- Front wheel speed sensor tone rings - one tone ring is located in each wheel bearing and wheel hub assembly and is serviced with the wheel bearing and wheel hub.
- HCU - located in the front, LH area of the engine compartment, underneath the Air Cleaner (ACL) assembly.
- Rear wheel speed sensors - one sensor is located in each rear brake caliper anchor plate. The sensors are serviced separately from the anchor plate.
- Rear wheel speed sensor tone rings - one tone ring is located on the end of each axle shaft and is serviced with the axle shaft. For axle shaft removal and installation information, refer to Section 205-02 .
- Stability/traction control switch - located on the LH instrument panel finish panel and is serviced separately from the finish panel.

## Anti-Lock Control

The anti-lock control system aids in the prevention of wheel lock-up during braking events which will allow the driver to maintain steering control and stop in the shortest distance possible under most conditions. This is accomplished by the ABS module and HCU modulating brake fluid pressure to the affected brake caliper(s).

When the anti-lock control system activates, any of the following can occur and are considered to be normal operation:

- A rumble or grinding sound may be heard
- If the driver's foot is on the brake pedal, a vibration may be felt in the brake pedal

### Engine Only Traction Control (EOTC) System

The Engine Only Traction Control (EOTC) system aids in the prevention of excessive wheel spin during acceleration which will allow the vehicle to maintain traction during acceleration. This is accomplished by the PCM modulating engine torque by reducing fuel injector pulses and ignition timing. The only function of the ABS in an EOTC system is to provide wheel speed information to the PCM along the High Speed Controller Area Network (HS-CAN) bus.

When the EOTC system activates, any of the following can occur and are considered to be normal operation:

- A small deceleration or a reduction in the acceleration of the vehicle
- The stability/traction control indicator ("sliding car" icon) flashes




### **Stability/Traction Control Switch**

The stability/traction control switch can be used by the driver to disable and enable the EOTC system. When the switch is pressed, the system is disabled. When the system is disabled, the stability/traction control indicator ("sliding-car icon") in the Instrument Cluster (IC) (or message center if equipped) will illuminate and the LED indicator on the switch will illuminate. The standard anti-lock control system cannot be disabled through the use of the stability/traction control switch.

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**Anti-Lock Control**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1138-A	Flex Probe Kit 105-R025B or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Principles of Operation****Anti-Lock Control**

The anti-lock control system is controlled by the ABS module which continuously monitors and compares the rotational speed of each wheel. The wheel speed sensors are connected to the ABS module by 2 circuits. One circuit provides voltage for sensor operation and the other circuit provides sensor input to the ABS module. As the wheels spin, the wheel speed sensor tone rings pass through the magnetic field generated by the active wheel speed sensor. This causes the strength of the magnetic field to increase (as a tooth passes the sensor) or decrease (as a gap passes the sensor) and generates a signal that is sent to the ABS module to indicate individual wheel speed.

When the ABS module detects an impending wheel lock-up, brake fluid pressure to the appropriate brake caliper will be modulated (pulsated). This is accomplished by opening and closing the appropriate solenoid valves inside the Hydraulic Control Unit (HCU) while the hydraulic pump motor is also actuated. Once the affected wheel returns to normal speed, the ABS module returns the solenoid valves to their normal position and the hydraulic pump motor is deactivated.

The ABS module is self-monitoring and will carry out self-tests at pre-determined times. When the ignition switch is turned to the RUN position, the ABS module will carry out a preliminary electrical check of the wheel speed sensors and their circuits by sending voltage through the sensor and checking for the voltage to return. When the vehicle is traveling at speeds above 21 km/h (13 mph) and the brake pedal is not being pressed, the pump motor will be commanded ON for approximately 0.5 second to check pump motor operation. Also, during all phases of operation while the vehicle is in motion, the ABS module checks for correct operation of the wheel speed sensors by comparing wheel speed input to other sensor input. Depending on the nature of the malfunction detected, the ABS module will deactivate the anti-lock control system and send a message over the High Speed Controller Area Network (HS-CAN) bus to the Instrument Cluster (IC). When the IC receives this message, it will illuminate the yellow ABS warning indicator.

**Electronic Brake Distribution (EBD)**

On initial application of the brake pedal, full pressure is applied to the rear brakes. The ABS module then uses wheel speed input to calculate an estimated rate of deceleration. Once vehicle deceleration exceeds a predetermined threshold, the ABS module closes the appropriate isolation valves in the HCU to hold the rear brake pressure constant while allowing the front brake pressure to build. This creates a balanced braking condition between the front and rear wheels and minimizes the chance of rear wheel lockup during hard braking. As the vehicle decelerates, the valves are opened to increase the rear brake pressure in proportion to the front brake pressure.

A slight bump sensation may be felt in the brake pedal when Electronic Brake Distribution (EBD) is active.

EBD will be disabled if there are 2 or more wheel speed sensor DTCs present in the ABS module. When EBD is disabled, the red brake warning indicator and the yellow ABS warning indicator will be illuminated.

### **Engine Only Traction Control (EOTC) System**

The Engine Only Traction Control (EOTC) system is controlled by the PCM and uses the same wheel speed sensors and tone rings that are used for the anti-lock control system. The ABS module continuously monitors the rotational speed of each wheel and sends that information to the PCM over the HS-CAN bus. When the PCM detects a wheel spinning excessively, it will assist with traction control by adjusting engine timing and decreasing fuel injector pulses. The PCM will also send a message to the IC indicating that a traction event is taking place, when the IC receives this message it will flash the stability/traction control indicator "sliding-car icon". Once the affected wheel returns to normal speed, the PCM returns engine timing and fuel injectors to normal operation and sends another message to the IC indicating that the traction event has ended and the IC extinguishes the stability/traction control indicator.

If wheel speed sensor DTCs are present in the ABS module or communication DTCs are present in the IC , PCM or ABS module, the EOTC system will also be disabled. When the system is disabled due to DTCs being present, both the ABS warning indicator and the stability/traction control indicator will be illuminated.


### **Stability/Traction Control Switch**

Unlike the standard anti-lock control system the EOTC system can be deactivated by the driver through the stability/traction control switch. The switch is hardwired to the PCM and when pressed sends a ground signal to the module. The PCM then sends a message over the HS-CAN bus to the IC indicating that the driver has requested that the system be deactivated. When the IC receives this message it illuminates the stability/traction control indicator "sliding-car icon" and sends a message to the Lighting Control Module (LCM) along the Standard Corporate Protocol (SCP) network. Once the LCM has received the message, it illuminates the LED in the stability/traction control switch. The PCM will ignore any traction control events until the driver presses the switch again or the ignition key is cycled.

### **Stability/Traction Control Indicator "Sliding-Car Icon"**

Status of the EOTC system is indicated by a stability/traction control indicator "sliding-car icon" located in the IC (or message center if equipped). When the driver disables the systems through the use of the stability/traction control switch, this indicator will illuminate solidly, when the system is currently active, the indicator will flash and when the system is disabled due to DTCs being present in the ABS module, the indicator will illuminate in conjunction with the yellow ABS warning indicator.

### **Inspection and Verification**

 **WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

1. Verify the customer concern.
2. Verify the stoplamps operate correctly by applying and releasing the brake pedal with the ignition switch in the OFF position. If the stoplamps do not operate correctly, refer to Diagnosis and Testing in [Section 417-01](#) . If the stoplamps operate correctly, proceed to the next step.
3. Visually inspect for obvious signs of mechanical and electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Base brake system</li> <li>• Incorrectly inflated tires</li> <li>• Mismatched wheels or tires</li> <li>• Hydraulic Control Unit (HCU)</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse(s): <ul style="list-style-type: none"> <li>◆ 106 (40A)</li> <li>◆ 109 (20A)</li> </ul> </li> <li>• Central Junction Box (CJB) fuse(s): <ul style="list-style-type: none"> <li>◆ 20 (10A)</li> <li>◆ 28 (7.5A)</li> </ul> </li> <li>• Wiring, terminals or connectors</li> <li>• Front wheel speed sensor jumper harness</li> <li>• Wheel speed sensor</li> <li>• Stoplamp switch</li> <li>• ABS module</li> </ul>

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
  - check the scan tool connection to the VCM .
  - refer to [Section 418-00](#) , No Power To The Scan Tool, to diagnose no power to the scan tool.
6. If the scan tool does not communicate with the vehicle:
    - verify the ignition key is in the ON position.
    - verify the scan tool operation with a known good vehicle.
    - refer to [Section 418-00](#) to diagnose no response from the PCM.
  7. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#) to diagnose the no communication concern.
    - If the network test passes, retrieve and record continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the ABS module.
9. If the DTCs retrieved are related to the concern, go to the ABS Module DTC Chart. For all other DTCs, refer to the Master DTC Chart in Section 419-10 .
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### ABS Module DTC Chart

DTC	Description	Source	Action
B1342	ECU is Faulted	ABS Module	<p><b>NOTE:</b> If other DTCs are present, repair them before installing a new component.</p> <p>CLEAR the DTCs. REPEAT the self-test. RETRIEVE the DTCs. If DTC B1342 is retrieved, INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. REPEAT the self-test.</p>
B1484	Brake Pedal Input Open Circuit	ABS Module	<u>GO to Pinpoint Test D</u> .
B1596	Service Continuous Codes	ABS Module	<p><b>NOTE:</b> This DTC does not indicate a malfunction of the ABS. If other DTCs are present, REPAIR them before diagnosing this DTC.</p> <p>Some DTCs cannot be detected by the ABS module until the ignition switch is cycled from ON to OFF and back to ON again. When DTCs are cleared using the scan tool, the ignition switch needs to be cycled in order to clear this DTC and have the ABS module check for other DTCs.</p> <p>DIAGNOSE all other DTCs. CLEAR the DTCs. CYCLE the ignition switch. RETRIEVE the DTCs. REFER to the ABS Module DTC Chart.</p>
B1676	Battery Pack Voltage Out of Range	ABS Module	<u>GO to Pinpoint Test E</u> .
B2477	Module Configuration Failure	ABS Module	CONFIGURE the ABS module. REFER to Programmable Module Installation (PMI) in <u>Section 418-01</u> . CLEAR the DTCs. REPEAT the self-test.
B2900	VIN Mismatch	ABS Module	<u>GO to Pinpoint Test G</u> .
C1145	Speed Wheel Sensor RF Input Circuit Failure	ABS Module	<u>GO to Pinpoint Test B</u> .
C1155	Speed Wheel Sensor LF Input Circuit Failure	ABS Module	<u>GO to Pinpoint Test B</u> .
C1165	Speed Wheel Sensor RR Input Circuit Failure	ABS Module	<u>GO to Pinpoint Test B</u> .
C1175			<u>GO to Pinpoint Test B</u> .

	Speed Wheel Sensor LR Input Circuit Failure	ABS Module	
C1222	Speed Wheel Mismatch	ABS Module	<u>GO to Pinpoint Test C .</u>
C1266	ABS Valve Power Relay Circuit Failure	ABS Module	<u>GO to Pinpoint Test F .</u>
C1296	Wheel Speed LF Signal Fault	ABS Module	<u>GO to Pinpoint Test C .</u>
C1297	Wheel Speed RF Signal Fault	ABS Module	<u>GO to Pinpoint Test C .</u>
C1298	Wheel Speed RR Signal Fault	ABS Module	<u>GO to Pinpoint Test C .</u>
C1299	Wheel Speed LR Signal Fault	ABS Module	<u>GO to Pinpoint Test C .</u>
C1300	ABS Pump Motor Circuit Failure	ABS Module	<u>GO to Pinpoint Test A .</u>
C1805	Mismatched PCM and/or ABS-TC Module	ABS Module	<u>GO to Pinpoint Test G .</u>
U0073	Control Module Communication Bus Off	ABS Module	REFER to <u>Section 418-00</u> to diagnose the High Speed Controller Area Network (HS-CAN) bus.
U0100	Lost Communication With ECM/PCM	ABS Module	REFER to <u>Section 418-00</u> to diagnose the HS-CAN bus.
U2050	No Application Present	ABS Module	CONFIGURE the ABS module. REFER to Programmable Module Installation (PMI) in <u>Section 418-01</u> . CLEAR the DTCs. REPEAT the self-test.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: DTC C1300

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

### Normal Operation

Fused battery voltage is provided to the ABS module from Battery Junction Box (BJB) fuses 109 (20A) and 106 (40A) along circuits 483 (RD) and 601 (LB/PK) respectively. Fused ignition voltage is provided from Central Junction Box (CJB) fuse 20 (10A) along circuit 1789 (VT/WH). When necessary, the ABS module supplies voltage to the Hydraulic Control Unit (HCU) assembly and the pump motor is activated. The ABS



module is provided a ground along circuit 57 (BK) and the hydraulic pump motor is provided a ground internally through the HCU .

- DTC C1300 (ABS Hydraulic Pump Motor Circuit Failure) - When the ignition key is in the RUN position, if the ABS module detects an open circuit, a short to voltage, a short to ground or a seized pump motor, DTC C1300 will be set.

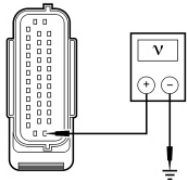
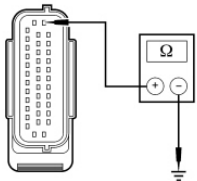
**This pinpoint test is intended to diagnose the following:**

- Fuse(s)
- Wiring, terminals or connectors
- ABS module
- HCU assembly

#### PINPOINT TEST A: DTC C1300

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>A1 CHECK FOR ABS MODULE ON-DEMAND DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Using the scan tool, clear all ABS module DTCs.</li> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module.</li> <li>• Retrieve and record all ABS module DTCs.</li> <li>• <b>Is DTC C1300 present?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> For all other DTCs, GO to the ABS Module DTC Chart.</p>
<b>A2 CHECK THE ABS PUMP MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>Is the ABS pump motor running all the time?</b></li> </ul>	<p><b>Yes</b> INSTALL a new ABS module and a new HCU . REFER to <u>Anti-Lock Brake System (ABS) Module</u> and <u>Hydraulic Control Unit (HCU)</u> in this section. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 CHECK THE PUMP MOTOR (PMP_MOTOR) ACTIVE COMMAND</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - ABS Module .</li> <li>• Toggle the PMP_MOTOR active command ON.</li> </ul>	<p><b>Yes</b> TOGGLE the PMP_MOTOR active command OFF. GO to <u>A4</u> .</p> <p><b>No</b> TOGGLE the ABS_MOTOR output command OFF.</p>

<ul style="list-style-type: none"> <li>• <b>Does the ABS pump motor run?</b></li> </ul>	GO to <u>A5</u> .
<b>A4 CHECK FOR RETURNING ABS MODULE DTCs</b>	
<ul style="list-style-type: none"> <li>• Using the scan tool, clear all ABS module DTCs.</li> <li>• Cycle the ignition switch and test drive the vehicle above 12 km/h (7.5 mph). Do not apply the brakes until the vehicle exceeds 32 km/h (20 mph).</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module.</li> <li>• <b>Are any DTCs present?</b></li> </ul>	<p><b>Yes</b> If DTC C1300 is present, GO to <u>A7</u>.</p> <p>For all other ABS module DTCs, GO to the ABS Module DTC Chart.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>
<b>A5 CHECK THE VOLTAGE TO THE ABS MODULE</b>	
<p><b>NOTE:</b> To access the ABS module connector, remove the air cleaner assembly.</p> <ul style="list-style-type: none"> <li>• Disconnect: ABS Module C135.</li> <li>• Measure the voltage between ABS module C135-1, circuit 601 (LB/PK), harness side and ground.</li> </ul>  <p>N0058091</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A6</u>.</p> <p><b>No</b> VERIFY BJB fuse 106 (40A) is OK. If OK, REPAIR circuit 601 (LB/PK).</p> <p>If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.</p> <p>CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>
<b>A6 CHECK THE ABS MODULE GROUND CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ABS module C135-13, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0055398</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A7</u>.</p> <p><b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>

<b>A7 CHECK FOR CORRECT ABS MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect: ABS Module C135.</li> <li>• Check the connector for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> <li>◆ spread terminals.</li> </ul> </li> <li>• Connect: ABS Module C135.</li> <li>• Make sure the connector seats correctly, then operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b>  INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. TEST the system for normal operation.</p> <p>If DTC C1300 returns, INSTALL a new HCU . REFER to <u>Hydraulic Control Unit (HCU)</u> in this section.</p> <p><b>No</b>  The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>

**Pinpoint Test B: DTCs C1145, C1155, C1165 and C1175**

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

**Normal Operation**

The wheel speed sensor generates an analog signal that is proportional to wheel speed. The wheel speed sensor circuitry connects to the ABS module connector C135 through 2 wires and a connector at each wheel speed sensor. When the ignition is turned to the RUN position, the ABS module carries out a self-test by sending a reference voltage through the wheel speed sensors and their circuitry to determine if they are functional. Power and ground are supplied to the wheel speed sensors from the ABS module.

The front wheel speed sensors are integral to the wheel hub and bearing assembly and have a serviceable jumper harness connecting the sensor to the main wire harness.

<b>DTC Description</b>	<b>Fault Trigger Conditions</b>
<ul style="list-style-type: none"> <li>• DTC C1145 - Wheel Speed Sensor RF Input Circuit Failure</li> <li>• DTC C1155 - Wheel Speed Sensor LF Input Circuit Failure</li> <li>• DTC C1165 - Wheel Speed Sensor RR Input Circuit Failure</li> <li>• DTC C1175 - Wheel Speed Sensor LR Input Circuit Failure</li> </ul>	<p>When the vehicle speed exceeds 5 km/h (3 mph) or when the ABS module self-test is carried out, if the ABS module detects a short to ground, a short to voltage, an open circuit or a defective wheel speed sensor, the corresponding DTC will be set.</p>

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Front wheel speed sensor jumper harness
- Wheel speed sensor(s)
- ABS module

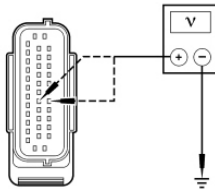
**PINPOINT TEST B: DTCs C1145, C1155, C1165 AND C1175**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<p><b>B1 CHECK THE SUSPECT WHEEL SPEED SENSOR FOR AN OPEN</b></p> <p><b>NOTE:</b> To access the LH front wheel speed sensor electrical connector, remove the Air Cleaner (ACL) assembly. To access the rear wheel speed sensors, remove the rear seat cushion.</p> <ul style="list-style-type: none"> <li>• Disconnect: Suspect Wheel Speed Sensor.</li> <li>• Measure the resistance between the suspect wheel speed sensor terminals, component side.</li> </ul> <div> <p>The diagram shows a cross-section of a wheel speed sensor with two electrical terminals. Wires from these terminals are connected to a multimeter, which is represented by a rectangle containing the Greek letter Omega (Ω) and two circular terminals with '+' and '-' signs.</p> </div> <p style="text-align: right; font-size: small;">GH2045-A</p> <ul style="list-style-type: none"> <li>• Is the resistance between 1,000 and 2,000 ohms for the front wheel speed sensors, and between 1,300 and 1,900 ohms for the rear wheel speed sensors?</li> </ul>	<p><b>Yes</b> CONNECT the wheel speed sensor. GO to <u>B2</u> .</p> <p><b>No</b> For front wheel speed sensors, thoroughly INSPECT the front wheel speed sensor jumper harness. If the jumper harness is not OK, INSTALL a new jumper harness. If the jumper harness is OK, INSTALL a new front wheel speed sensor, REFER to <u>Wheel Speed Sensor - Front</u> in this section. For rear wheel speed sensors, INSTALL a new rear wheel speed sensor, REFER to <u>Wheel Speed Sensor - Rear</u> in this section. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>
<p><b>B2 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	

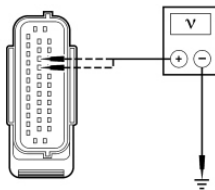
**NOTE:** To access the ABS module connector, remove the ACL assembly.

- Ignition OFF.
- Disconnect: ABS Module C135.
- Ignition ON.
- **For DTC C1145 (RF)** , measure the voltage between ground and:
  - ◆ ABS module C135-6, circuit 514 (YE/RD), harness side.
  - ◆ ABS module C135-18, circuit 516 (YE/BK), harness side.



N0090688

- **For DTC C1155 (LF)** , measure the voltage between ground and:
  - ◆ ABS module C135-22, circuit 521 (TN/OG), harness side.
  - ◆ ABS module C135-21, circuit 522 (TN/BK), harness side.



N0090689

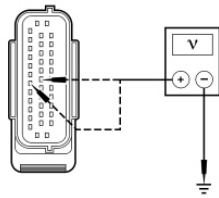
- **For DTC C1165 (RR)** , measure the voltage between ground and:
  - ◆ ABS module C135-31, circuit 523 (RD/PK), harness side.
  - ◆ ABS module C135-19, circuit 524 (PK/BK), harness side.

**Yes**

REPAIR the affected circuit(s). CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.

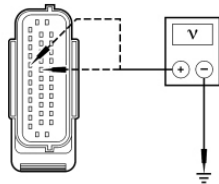
**No**

GO to B3 .



N0090690

- **For DTC C1175 (LR)** , measure the voltage between ground and:
  - ◆ ABS module C135-20, circuit 518 (LG/RD), harness side.
  - ◆ ABS module C135-33, circuit 519 (LG/BK), harness side.

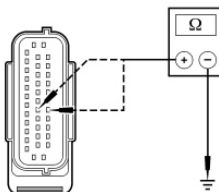


N0090691

- **Is any voltage present?**

### B3 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- **For DTC C1145 (RF)** , measure the resistance between ground and:
  - ◆ ABS module C135-6, circuit 514 (YE/RD), harness side.
  - ◆ ABS module C135-18, circuit 516 (YE/BK), harness side.

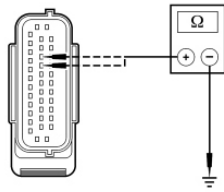


N0090692

- **For DTC C1155 (LF)** , measure the resistance between ground and:
  - ◆ ABS module C135-22, circuit 521 (TN/OG), harness side.
  - ◆ ABS module C135-21, circuit 522 (TN/BK), harness side.

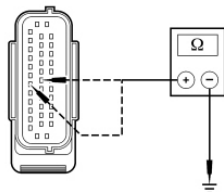
**Yes**  
GO to **B4** .

**No**  
REPAIR the affected circuit(s). CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.



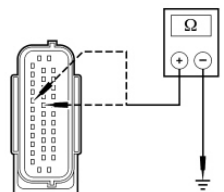
N0090693

- **For DTC C1165 (RR)** , measure the resistance between ground and:
  - ◆ ABS module C135-31, circuit 523 (RD/PK), harness side.
  - ◆ ABS module C135-19, circuit 524 (PK/BK), harness side.



N0090694

- **For DTC C1175 (LR)** , measure the resistance between ground and:
  - ◆ ABS module C135-20, circuit 518 (LG/RD), harness side.
  - ◆ ABS module C135-33, circuit 519 (LG/BK), harness side.



N0090695

- **Are the resistances greater than 10,000 ohms?**

#### **B4 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR AN OPEN**

- Measure the resistance between the ABS module connector, harness side and the suspect wheel speed sensor connector, harness side as indicated in the following chart:

**Yes**  
GO to **B5** .

**No**  
REPAIR the affected circuit(s). CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.

ABS Module	Circuit	Wheel Speed Sensor
<b>DTC C1145 (RF)</b>		
C135-6	514 (YE/RD)	C160-1
C135-18	516 (YE/BK)	C160-2
<b>DTC C1155 (LF)</b>		
C135-22	521 (TN/OG)	C150-1
C135-21	522 (TN/BK)	C150-2
<b>DTC C1165 (RR)</b>		
C135-31	523 (RD/PK)	C426-1
C135-19	524 (PK/BK)	C426-2
<b>DTC C1175 (LR)</b>		
C135-20	518 (LG/RD)	C440-1
C135-33	5198 (LG/BK)	C440-2
<ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>		
<b>B5 CHECK FOR CORRECT ABS MODULE OPERATION</b>		
<ul style="list-style-type: none"> <li>• Check ABS module connector C135 for:             <ul style="list-style-type: none"> <li>♦ corrosion.</li> <li>♦ pushed-out pins.</li> <li>♦ spread terminals.</li> </ul> </li> <li>• Connect: ABS Module C135.</li> <li>• Make sure the connector seats correctly, then operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>		<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>

**Pinpoint Test C: DTCs C1222, C1296, C1297, C1298 and C1299**

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.



**Normal Operation**

The wheel speed sensor generates an analog signal that is proportional to wheel speed. The wheel speed sensor circuitry connects to the ABS module connector C135 through 2 wires and a connector at each wheel speed sensor. When the ignition is turned to the RUN position, the ABS module carries out a self-test by sending a reference voltage through the wheel speed sensors and their circuitry to determine if they are functional. Power and ground are supplied to the wheel speed sensors from the ABS module.

The front wheel speed sensors are integral to the wheel hub and bearing assembly and have a serviceable jumper harness connecting the sensor to the main wire harness.

DTC Description	Fault Trigger Conditions
<ul style="list-style-type: none"> <li>• DTC C1222 - Wheel Speed Mismatch</li> </ul>	When the vehicle speed exceeds 20 km/h (12 mph), if the ABS module detects a difference between wheel speed sensor signals, DTC C1222 will be set. DTC C1222 can also be set by damaged tone rings, mismatched wheel and/or tire sizes or driving the vehicle on one or more deflated tires.
<ul style="list-style-type: none"> <li>• DTC C1296 - Wheel Speed LF Input Signal Missing</li> <li>• DTC C1297 - Wheel Speed RF Input Signal Missing</li> <li>• DTC C1298 - Wheel Speed RR Input Signal Missing</li> <li>• DTC C1299 - Wheel Speed LR Input Signal Missing</li> </ul>	When the vehicle speed exceeds 5 km/h (9 mph), if the signal from the wheel speed sensor is intermittent, shorted to ground or missing, the corresponding DTC will be set.


**This pinpoint test is intended to diagnose the following:**

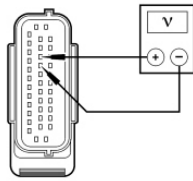
- Front wheel speed sensor jumper harness
- Wheel speed sensor
- Wheel speed tone ring
- ABS module

**PINPOINT TEST C: DTCs C1222, C1296, C1297, C1298 AND C1299**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

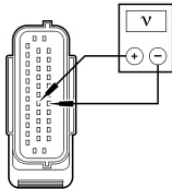
Test Step	Result / Action to Take
<b>C1 CHECK THE TIRES SIZE AND PRESSURE</b>	

<ul style="list-style-type: none"> <li>• Verify that all tires and wheels are the same size and that the inflation pressures are correct as indicated on the Vehicle Identification Label (VIL).</li> <li>• <b>Are the wheels and tires OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> INSTALL the correct size tire or adjust tire pressure as necessary. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied.</p>
<b>C2 CHECK THE WHEEL SPEED SENSOR</b>	
<ul style="list-style-type: none"> <li>•  <b>WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.</b></li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Check the suspect wheel speed sensor for correct mounting, excessive dirt build up, metal obstructions, incorrect harness routing and chafing.</li> <li>• <b>Is the suspect wheel speed sensor OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> For front wheel speed sensors, thoroughly inspect the front wheel speed sensor jumper harness. If the jumper harness is not OK, INSTALL a new jumper harness. If the jumper harness is OK, INSTALL a new front wheel speed sensor, REFER to <u>Wheel Speed Sensor - Front</u> in this section. For rear wheel speed sensors, INSTALL a new rear wheel speed sensor, REFER to <u>Wheel Speed Sensor - Rear</u> in this section. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied. If equipped with a fire suppression system, GO to <u>C8</u> .</p>
<b>C3 CHECK THE WHEEL SPEED SENSOR TONE RING</b>	
<ul style="list-style-type: none"> <li>• Check the suspect wheel speed sensor tone ring for corrosion, nicks, damaged teeth, correct mounting, alignment and consistent air gap.</li> <li>• <b>Is the suspect wheel speed sensor tone ring OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C4</u> .</p> <p><b>No</b> REPAIR or INSTALL a new wheel speed sensor ring. REFER to <u>Section 204-01</u> for front or <u>Section 205-02</u> for rear. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied. If equipped with a fire suppression system, GO to <u>C8</u> .</p>
<b>C4 CHECK THE WHEEL SPEED SENSOR OUTPUT</b>	
<p><b>NOTE:</b> To access the ABS module connector, remove the Air Cleaner (ACL) assembly.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: ABS Module C135.</li> <li>• <b>For DTC C1296 (LF)</b> , while spinning the suspect wheel at one revolution per second, measure the AC voltage between ABS module C135-22, circuit 521 (TN/OG), harness side and ABS module C135-21, circuit 522 (TN/BK), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>C7</u> .</p> <p><b>No</b> GO to <u>C5</u> .</p>



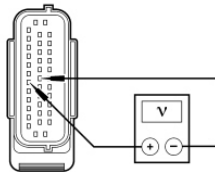
N0090696

- **For DTC C1297 (RF)** , while spinning the suspect wheel at one revolution per second, measure the AC voltage between ABS module C135-6, circuit 514 (YE/RD), harness side and ABS module C135-18, circuit 516 (YE/BK), harness side.



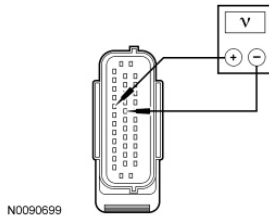
N0090697

- **For DTC C1298 (RR)** , while spinning the suspect wheel at one revolution per second, measure the AC voltage between ABS module C135-31, circuit 523 (RD/PK), harness side and ABS module C135-19, circuit 524 (PK/BK), harness side.



N0090698

- **For DTC C1299 (LR)** , while spinning the suspect wheel at one revolution per second, measure the AC voltage between ABS module C135-20, circuit 518 (LG/RD), harness side and ABS module C135-33, circuit 519 (LG/BK), harness side.



- Are the voltages between 100 and 3,500 millivolts AC?

#### C5 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR AN OPEN

**NOTE:** To access the LH front wheel speed sensor electrical connector, remove the air cleaner assembly. To access the rear wheel speed sensors, remove the rear seat cushion.

- Disconnect: Suspect Wheel Speed Sensor.
- Measure the resistance between the ABS module connector, harness side and the suspect wheel speed sensor connector, harness side as indicated in the following chart:

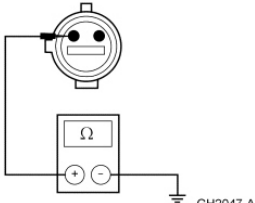

ABS Module	Circuit	Wheel Speed Sensor
<b>DTC C1296 (LF)</b>		
C135-22	521 (TN/OG)	C150-1
C135-21	522 (TN/BK)	C150-2
<b>DTC C1297 (RF)</b>		
C135-6	514 (YE/RD)	C160-1
C135-18	516 (YE/BK)	C160-2
<b>DTC C1298 (RR)</b>		
C135-31	523 (RD/PK)	C426-1
C135-19	524 (PK/BK)	C426-2
<b>DTC C1299 (LR)</b>		
C135-20	518 (LG/RD)	C440-1
C135-33	519 (LG/BK)	C440-2

- Are the resistances less than 5 ohms?

#### C6 CHECK THE SUSPECT WHEEL SPEED SENSOR FOR A SHORT TO GROUND

**Yes**  
GO to C6 .

**No**  
REPAIR the affected circuit(s). CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied. If equipped with a fire suppression system, GO to C8 .

<ul style="list-style-type: none"> <li>• Measure the resistance between the suspect wheel speed sensor terminal and ground.</li> </ul>  <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C7</u> .</p> <p><b>No</b> For front wheel speed sensors, thoroughly INSPECT the front wheel speed sensor jumper harness. If the jumper harness is not OK, INSTALL a new jumper harness. If the jumper harness is OK, INSTALL a new front wheel speed sensor, REFER to <u>Wheel Speed Sensor - Front</u> in this section. For rear wheel speed sensors, INSTALL a new rear wheel speed sensor, REFER to <u>Wheel Speed Sensor - Rear</u> in this section. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied. If equipped with fire a suppression system, GO to <u>C8</u> .</p>
<p><b>C7 CHECK FOR CORRECT ABS MODULE OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Check ABS module connector C135 for: <ul style="list-style-type: none"> <li>♦ corrosion.</li> <li>♦ pushed-out pins.</li> <li>♦ spread terminals.</li> </ul> </li> <li>• Connect: ABS Module C135.</li> <li>• Make sure the connector seats correctly, then operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>C8</u> .</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. CARRY OUT the self-test with the brake pedal not applied. If equipped with a fire suppression system, GO to <u>C8</u> .</p>
<p><b>C8 REPOWER THE FIRE SUPPRESSION SYSTEM</b></p>	
<ul style="list-style-type: none"> <li>•  <b>WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 100-02B</u> . Failure to follow these instructions may result in serious personal injury.</b></li> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> .</li> <li>• Is the fire suppression system repowered?</li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for fire suppression system depowering and repowering procedure.</p>

## Pinpoint Test D: DTC B1484

### Normal Operation

Fused battery voltage is sent to the Brake Pedal Position (BPP) switch from Central Junction Box (CJB) fuse 14 (20A) along circuit 1119 (RD). When the brake pedal is pressed, the BPP switch closes and the voltage is

then supplied to CJB fuse 28 (7.5A) along circuit 511 (LG) and then to the ABS module along circuit 1651 (WH/RD). The ABS module compares the BPP switch signal to BPP messages sent over the High Speed Controller Area Network (HS-CAN) bus to verify that the BPP switch signal is accurate.

The BPP switch is also known as the stoplamp switch.

- DTC B1484 (Brake Pedal Input Open Circuit) - If the BPP switch circuit 1651 (WH/RD) is open, DTC B1484 will set.

**This pinpoint test is intended to diagnose the following:**

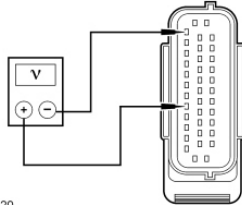
- Fuse(s)
- Wiring, terminals or connectors
- BPP switch
- ABS module

#### PINPOINT TEST D: DTC B1484

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>D1 CHECK THE BRAKE LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Press the brake pedal.</li> <li>• <b>Do the brake lamps illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> to diagnose the stoplamps.</p>
<b>D2 CHECK THE ABS MODULE BRAKE ON/OFF (BOO_ABS) PID</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - ABS Module.</li> <li>• Monitor the BOO_ABS PID while pressing and releasing the brake pedal.</li> <li>• <b>Does the BOO_ABS PID display ON with the brake pedal pressed and OFF with the brake pedal released?</b></li> </ul>	<p><b>Yes</b> CLEAR the DTCs. REPEAT the self-test. If DTC B1484 is retrieved, INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. REPEAT the self-test.</p> <p><b>No</b> GO to <u>D3</u> .</p>
<b>D3 CHECK THE VOLTAGE TO THE ABS MODULE</b>	
<p><b>NOTE:</b> Make sure the brake pedal is released for this step.</p> <p><b>NOTE:</b> To access the ABS module connector, remove the Air Cleaner (ACL) assembly.</p> <ul style="list-style-type: none"> <li>• Disconnect: ABS Module C135.</li> <li>• Press and hold the brake pedal.</li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> VERIFY CJB fuse 28 (7.5A) is OK. If OK, REPAIR circuit 1651 (WH/RD). If not OK,</p>

- Measure the voltage between ABS module C135-30, circuit 1651 (WH/RD), harness side and the ABS module C135-38, circuit 57 (BK), harness side.



N0085920

- Is the voltage greater than 10 volts?

REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test.

### Pinpoint Test E: DTC B1676

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

#### Normal Operation

Fused battery voltage is provided to the ABS module from Battery Junction Box (BJB) fuses 109 (20A) and 106 (40A) along circuits 483 (RD) and 601 (LB/PK) respectively. Fused ignition voltage is provided from Central Junction Box (CJB) fuse 20 (10A) along circuit 1789 (VT/WH). When necessary, the ABS module supplies voltage to the Hydraulic Control Unit (HCU) assembly and the pump motor is activated. The ABS module is provided a ground along circuit 57 (BK) and the hydraulic pump motor is provided a ground internally through the HCU .

- DTC B1676 (Battery Pack Voltage Out of Range) - When the vehicle speed exceeds 6 km/h (4 mph), if the battery voltage exceeds 17 volts or falls below 9 volts, DTC B1676 will be set.

#### This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- ABS module

#### PINPOINT TEST E: DTC B1676

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

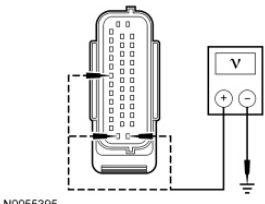
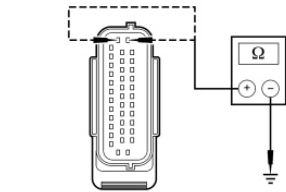
**NOTE:** DTC B1676 can be set if the vehicle has been recently jump started, the battery has been recently charged or the battery has been discharged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if the battery has been left unattended with the accessories on.

**NOTE:** Carry out a thorough inspection and verification before proceeding with the pinpoint test. Refer to Inspection and Verification in this section.

Test Step	Result / Action to Take
E1 RETRIEVE ALL CMDTCs IN ALL MODULES	

<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - All Continuous Memory Diagnostic Trouble Codes (CMDTCs).</li> <li>• <b>Is DTC B1317, B1318 or B1676 present in one or more modules AND DTC P0563, P0620, P0625, P0626 or P065B present in the PCM?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> for diagnosis of the battery and charging system.</p> <p><b>No</b> GO to <a href="#">E2</a> .</p>
<b>E2 CHECK BATTERY CONDITION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Refer to <a href="#">Section 414-01</a> and carry out the Battery - Condition Test.</li> <li>• <b>Does the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> If the battery passed the condition test but required a recharge, REFER to <a href="#">Section 414-00</a> to diagnose the charging system. CLEAR the DTCs. REPEAT the self-test.</p> <p>If the battery passed the condition test and did not require a recharge, GO to <a href="#">E3</a> .</p> <p><b>No</b> INSTALL a new battery. CLEAR the DTCs. REPEAT the self-test.</p>
<b>E3 CHECK CHARGING SYSTEM VOLTAGE</b>	
<p><b>NOTE:</b> Do not allow the engine speed to increase above 2,000 rpm while performing this step or the generator may self excite and result in default charging system output voltage. If engine speed goes above 2,000 rpm, shut the vehicle OFF and restart the engine before performing this step.</p> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Measure the voltage of the battery with and without a load on the charging system as follows:             <ul style="list-style-type: none"> <li>◆ Turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes while measuring battery voltage.</li> <li>◆ Turn on headlights and HVAC fan on high and run engine at 1,500 rpm for a minimum of 2 minutes while measuring battery voltage.</li> </ul> </li> </ul> <div> </div> <p style="text-align: center;">AJ0210-A</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages between 13 and 15.2 volts?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">E4</a> .</p> <p><b>No</b> REFER to <a href="#">Section 414-00</a> to diagnose the charging system. CLEAR the DTCs. REPEAT the self-test.</p>
<b>E4 CHECK FOR VOLTAGE TO THE ABS MODULE</b>	



<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: ABS Module C135.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and:             <ul style="list-style-type: none"> <li>◆ ABS module C135-32, circuit 1789 (VT/WH), harness side.</li> <li>◆ ABS module C135-25, circuit 483 (RD), harness side.</li> <li>◆ ABS module C135-1, circuit 601 (LB/PK), harness side.</li> </ul> </li> </ul>  <p>N0055395</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <b>E5</b> .</p> <p><b>No</b> VERIFY that BJB fuses 109 (20A), 106 (40A) and CJB fuse 20 (10A) are OK. If the fuse(s) are OK, REPAIR the circuit in question. If a fuse is not OK, REFER to the Wiring Diagrams manual to identify possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test.</p>
<p><b>E5 CHECK THE ABS MODULE GROUND CIRCUITS FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and:             <ul style="list-style-type: none"> <li>◆ ABS module C135-13, circuit 57 (BK), harness side.</li> <li>◆ ABS module C135-38, circuit 57 (BK), harness side.</li> </ul> </li> </ul>  <p>N0055396</p> <ul style="list-style-type: none"> <li>• Repeat this measurement while wiggling the harness.</li> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <b>E6</b> .</p> <p><b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.</p>
<p><b>E6 CHECK FOR CORRECT ABS MODULE OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check ABS module connector C135 for:             <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out/bent pins.</li> <li>◆ spread terminals.</li> </ul> </li> <li>• Connect: ABS Module C135.</li> <li>• Make sure the connector seats correctly, then operate the system and determine if the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. CLEAR all CMDTCs . REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>

**Pinpoint Test F: DTC C1266**

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

Fused battery voltage is provided to the ABS module from Battery Junction Box (BJB) fuses 109 (20A) and 106 (40A) along circuits 483 (RD) and 601 (LB/PK) respectively. Fused ignition voltage is provided from Central Junction Box (CJB) fuse 20 (10A) along circuit 1789 (VT/WH). When necessary, the ABS module supplies voltage to the Hydraulic Control Unit (HCU) assembly and the pump motor is activated. The ABS module is provided a ground along circuit 57 (BK) and the hydraulic pump motor is provided a ground internally through the HCU .

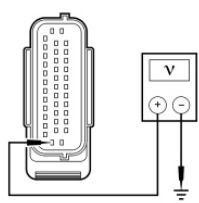
- DTC C1266 (ABS Valve Power Relay Circuit Failure) - If the ABS module detects an open circuit or a short to ground in the valve power circuit, DTC C1266 will be set.

**This pinpoint test is intended to diagnose the following:**

- Fuses
- Wiring, terminals or connectors
- ABS module

**PINPOINT TEST F: DTC C1266**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>F1 CHECK THE VOLTAGE TO THE ABS MODULE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: ABS Module C135.</li> <li>• Measure the voltage between ABS module C135-25, circuit 483 (RD), harness side and ground.</li> </ul>  <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> VERIFY BJB fuse 109 (20A) is OK. If OK, REPAIR circuit 483 (RD). If the fuse is not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. TEST the system for normal operation.</p>

**Pinpoint Test G: DTCs B2900 and C1805**

**Normal Operation**

When the ignition is turned to the RUN position, the ABS module and the PCM share the Vehicle Identification Number (VIN) over the High Speed Controller Area Network (HS-CAN) bus.

- DTC B2900 ( VIN Mismatched) - If the VIN stored in the ABS module does not match the VIN transmitted by the PCM, DTC B2900 will set.
- DTC C1805 (Mismatched PCM and/or ABS-TC Module) - If the powertrain information sent from the PCM to the ABS module over the HS-CAN bus does not match the powertrain information stored in the ABS module or if the ABS module cannot receive PCM network messages due to a network concern, DTC C1805 will set.

**This pinpoint test is intended to diagnose the following:**

- Module configuration (ABS and PCM)
- ABS module

**PINPOINT TEST G: DTCs B2900 AND C1805**

Test Step	Result / Action to Take
<b>G1 VERIFY PCM VIN</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Using the scan tool, carry out the Network Test.</li> <li>• Enter the following diagnostic mode on the scan tool: Log Viewer.</li> <li>• Compare the VIN in Log Viewer to the VIN plate on the vehicle.</li> <li>• <b>Does the VIN in Log Viewer match the vehicle VIN plate?</b></li> </ul>	<p><b>Yes</b> GO to <u>G2</u> .</p> <p><b>No</b> RECONFIGURE the PCM. FOLLOW the instructions on the scan tool. CLEAR the DTCs. CYCLE the ignition key. REPEAT the self-test.</p>
<b>G2 VERIFY ABS MODULE PART NUMBER</b>	
<ul style="list-style-type: none"> <li>• Retrieve and record the ABS module part number from Log Viewer and verify that the vehicle has the correct ABS module installed.</li> <li>• <b>Is the correct ABS module installed in the vehicle?</b></li> </ul>	<p><b>Yes</b> CONFIGURE the ABS module. REFER to Programmable Module Installation (PMI) Using the Integrated Diagnostic System (IDS) When the Original Module is NOT Available in <u>Section 418-01</u> . CLEAR the DTC. CYCLE the ignition key. REPEAT the self-test.</p> <p><b>No</b> INSTALL a new ABS module. REFER to <u>Anti-Lock Brake System (ABS) Module</u> in this section. CLEAR the DTC. CYCLE the ignition key. REPEAT the self-test.</p>

**Pinpoint Test H: Poor Vehicle Tracking During Anti-Lock Function**



**Normal Operation**

Fused battery voltage is provided to the ABS module from Battery Junction Box (BJB) fuses 109 (20A) and 106 (40A) along circuits 483 (RD) and 601 (LB/PK) respectively. Fused ignition voltage is provided from Central Junction Box (CJB) fuse 20 (10A) along circuit 1789 (VT/WH). When necessary, the ABS module supplies voltage to the Hydraulic Control Unit (HCU) assembly and the pump motor is activated. The ABS module is provided a ground along circuit 57 (BK) and the hydraulic pump motor is provided a ground internally through the HCU .

**This pinpoint test is intended to diagnose the following:**

- Base brake system
- HCU assembly
- Circuit shorted

**PINPOINT TEST H: POOR VEHICLE TRACKING DURING ANTI-LOCK FUNCTION**

Test Step	Result / Action to Take
<b>H1 BLEED THE BRAKE SYSTEM</b>	
<ul style="list-style-type: none"> <li>•  <b>WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</b></li> <li>• Bleed the brake system. Refer to <u>Section 206-00</u> .</li> <li>• Place the air suspension switch in the ON position and test drive the vehicle.</li> <li>• <b>Does the vehicle track poorly?</b></li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> The brake system is operating correctly at this time. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>H11</u> .</p>
<b>H2 CHECK THE LF HCU VALVE OPERATION</b>	
<ul style="list-style-type: none"> <li>•  <b>WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</b></li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• With the wheels off the ground, spin each wheel by hand to make sure that they spin freely (the transmission must be in the NEUTRAL position).</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - ABS Module.</li> <li>• Toggle the ABS pump motor (PMP_MOTOR) active command ON for 4 seconds.</li> <li>• Apply moderate brake pedal effort.</li> <li>• Have an assistant attempt to rotate the LF wheel.</li> <li>• <b>Does the LF wheel rotate?</b></li> </ul>	<p><b>Yes</b> TOGGLE the PMP_MOTOR command OFF. INSTALL a new HCU . REFER to <u>Hydraulic Control Unit (HCU)</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>H11</u> .</p> <p><b>No</b> TOGGLE the PMP_MOTOR command OFF. GO to <u>H3</u> .</p>
<b>H3 CHECK THE LF HCU VALVE RELEASE</b>	

<ul style="list-style-type: none"> <li>• Toggle the following active commands ON: <ul style="list-style-type: none"> <li>◆ LF inlet valve (LF_INLET)</li> <li>◆ LF outlet valve (LF_OUTLET)</li> </ul> </li> <li>• Immediately after toggling the active command ON, have an assistant spin the LF wheel using a 2-foot lever, such as a breaker bar.</li> <li>• <b>Does the LF wheel spin?</b></li> </ul>	<p><b>Yes</b> TOGGLE both commands OFF. GO to <b>H4</b> .</p> <p><b>No</b> TOGGLE both commands OFF. GO to <b>H10</b> .</p>
<b>H4 CHECK THE RF HCU VALVE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Toggle the PMP_MOTOR active command ON for 4 seconds.</li> <li>• Apply moderate brake pedal effort.</li> <li>• Have an assistant attempt to rotate the RF wheel.</li> <li>• <b>Does the RF wheel rotate?</b></li> </ul>	<p><b>Yes</b> TOGGLE the PMP_MOTOR command OFF. INSTALL a new HCU . REFER to <u>Hydraulic Control Unit (HCU)</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <b>H11</b> .</p> <p><b>No</b> TOGGLE the PMP_MOTOR active command OFF. GO to <b>H5</b> .</p>
<b>H5 CHECK THE RF HCU VALVE RELEASE</b>	
<ul style="list-style-type: none"> <li>• Toggle the following active commands ON: <ul style="list-style-type: none"> <li>◆ RF inlet valve (RF_INLET)</li> <li>◆ RF outlet valve (RF_OUTLET)</li> </ul> </li> <li>• Immediately after toggling the active command ON, have an assistant spin the RF wheel using a 2-foot lever, such as a breaker bar.</li> <li>• <b>Does the RF wheel spin?</b></li> </ul>	<p><b>Yes</b> TOGGLE both active commands OFF. GO to <b>H6</b> .</p> <p><b>No</b> TOGGLE both active commands OFF. GO to <b>H10</b> .</p>
<b>H6 CHECK THE LR HCU VALVE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Toggle the PMP_MOTOR active command ON for 4 seconds.</li> <li>• Apply moderate brake pedal effort.</li> <li>• Have an assistant attempt to rotate the LR wheel.</li> <li>• <b>Does the LR wheel rotate?</b></li> </ul>	<p><b>Yes</b> TOGGLE the PMP_MOTOR active command OFF. INSTALL a new HCU . REFER to <u>Hydraulic Control Unit (HCU)</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <b>H11</b> .</p> <p><b>No</b> TOGGLE the PMP_MOTOR active command OFF. GO to <b>H7</b> .</p>
<b>H7 CHECK THE LR HCU VALVE RELEASE</b>	
<ul style="list-style-type: none"> <li>• Toggle the following active commands ON: <ul style="list-style-type: none"> <li>◆ LR inlet valve (LR_INLET)</li> <li>◆ LR outlet valve (LR_OUTLET)</li> </ul> </li> <li>• Immediately after toggling the active command ON, have an assistant spin the LR wheel using a 2-foot lever, such as a breaker bar.</li> <li>• <b>Does the LR wheel spin?</b></li> </ul>	<p><b>Yes</b> TOGGLE both commands OFF. GO to <b>H8</b> .</p> <p><b>No</b> TOGGLE both commands OFF. GO to <b>H10</b> .</p>
<b>H8 CHECK THE RR HCU VALVE OPERATION</b>	
	<p><b>Yes</b> TOGGLE the PMP_MOTOR command</p>

<ul style="list-style-type: none"> <li>• Toggle the ABS module PMP_MOTOR active command ON for 4 seconds.</li> <li>• Apply moderate brake pedal effort.</li> <li>• Have an assistant attempt to rotate the RR wheel.</li> <li>• <b>Does the RR wheel rotate?</b></li> </ul>	<p>OFF. INSTALL a new HCU . REFER to <u>Hydraulic Control Unit (HCU)</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>H11</u> .</p> <p><b>No</b> TOGGLE the PMP_MOTOR command OFF. GO to <u>H9</u> .</p>
<b>H9 CHECK THE RR HCU VALVE RELEASE</b>	
<ul style="list-style-type: none"> <li>• Toggle the following active commands ON: <ul style="list-style-type: none"> <li>♦ RR inlet valve (RR_INLET)</li> <li>♦ RR outlet valve (RR_OUTLET)</li> </ul> </li> <li>• Immediately after toggling the active command ON, have an assistant spin the RR wheel using a 2-foot lever, such as a breaker bar.</li> <li>• <b>Does the RR wheel spin?</b></li> </ul>	<p><b>Yes</b> TOGGLE both commands OFF. The anti-lock brake system is operating correctly at this time. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>H11</u> .</p> <p><b>No</b> TOGGLE both commands OFF. GO to <u>H10</u> .</p>
<b>H10 CHECK FOR DTCs</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Self Test - ABS Module.</li> <li>• Retrieve and record any ABS module DTCs.</li> <li>• <b>Are any DTCs present?</b></li> </ul>	<p><b>Yes</b> GO to the ABS Module DTC Chart.</p> <p><b>No</b> INSTALL a new HCU . REFER to <u>Hydraulic Control Unit (HCU)</u> in this section. TEST the system for normal operation. If equipped with a fire suppression system, GO to <u>H11</u> .</p>
<b>H11 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</b></li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> .</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for fire suppression depowering and repowering procedure.</p>

### Pinpoint Test I: The Engine Only Traction Control (EOTC) System Cannot be Disabled

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

#### Normal Operation

The Engine Only Traction Control (EOTC) system is controlled by the PCM and utilizes the ABS module for wheel speed information only. EOTC helps maintain vehicle traction during acceleration by modulating engine torque. The EOTC system can be disabled by pressing the stability/traction control switch located in

the instrument panel. Fused ignition voltage is sent to the stability/traction control switch along circuit 640 (RD/YE) from Central Junction Box (CJB) fuse 26 (10A). When the switch is pressed, this voltage is sent to the PCM along circuit 959 (GY). When the PCM receives this voltage it will disable the EOTC system and send a message to the Instrument Cluster (IC) and the Lighting Control Module (LCM) along the High Speed Controller Area Network (HS-CAN) bus.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Stability/traction control switch
- PCM

**PINPOINT TEST I: THE ENGINE ONLY TRACTION CONTROL (EOTC) SYSTEM CANNOT BE DISABLED**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>I1 CHECK FOR DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - All Continuous Memory Diagnostic Trouble Codes (CMDTCs).</li> <li>• <b>Are any DTCs present in the PCM, Instrument Cluster (IC) or ABS module?</b></li> </ul>	<p><b>Yes</b> For PCM DTCs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) Manual.</p> <p>For IC DTCs, REFER to the DTC Chart in <u>Section 419-10</u> .</p> <p>For ABS module DTCs, GO to the ABS Module DTC Chart.</p> <p><b>No</b> GO to <u>I2</u> .</p>
<b>I2 CHECK THE STABILITY/TRACTION CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Stability/Traction Control Switch C280.</li> <li>• Place the stability/traction control switch in the ON position.</li> <li>• Measure the resistance between stability/traction control switch C280 pin-1 and pin-2, component side.</li> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>I3</u> .</p> <p><b>No</b> INSTALL a new stability/traction control switch. REFER to <u>Stability/Traction Control Switch</u> in this section. TEST the system for normal operation.</p>
<b>I3 CHECK THE SWITCH CONTROL CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Measure the resistance between PCM C175B-8, circuit 959 (GY), harness side and stability/traction control switch C280-1, circuit 959 (GY), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> REPAIR circuit 959 (GY). TEST the system for normal operation.</p>

<div></div> <div><p>• Is the resistance less than 5 ohms?</p></div>	
<div><p>I4 CHECK THE SWITCH CONTROL CIRCUIT FOR A SHORT TO GROUND</p></div>	
<div><p>• Measure the resistance between stability/traction control switch C280-1, circuit 959 (GY), harness side and ground.</p></div> <div></div> <div><p>• Is the resistance greater than 10,000 ohms?</p></div>	<div><p><b>Yes</b> GO to <u>I5</u> .</p></div> <div><p><b>No</b> REPAIR circuit 959 (GY). TEST the system for normal operation.</p></div>
<div><p>I5 CHECK THE VOLTAGE TO THE STABILITY/TRACTION CONTROL SWITCH</p></div>	
<div><p>• Ignition ON. • Measure the voltage between stability/traction control switch C280-2, circuit 640 (RD/YE), harness side and ground.</p></div> <div></div> <div><p>• Is the voltage greater than 10 volts?</p></div>	<div><p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p></div> <div><p><b>No</b> VERIFY CJB fuse 26 (10A) is OK. If OK, REPAIR circuit 640 (RD/YE). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.</p></div>

**Pinpoint Test J: The LED on the Stability/Traction Control Switch is Always Illuminated**

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.



**Normal Operation**

The LED on the stability/traction control switch is controlled by the Lighting Control Module (LCM). When the Engine Only Traction Control (EOTC) system is disabled through the use of the stability/traction control switch, the PCM sends a message to the Instrument Cluster (IC) along the High Speed Controller Area Network (HS-CAN) bus. The IC will relay this message to the LCM over the Standard Corporate Protocol (SCP) bus. When the LCM receives this message it will illuminate the indicator on the stability/traction control switch by applying voltage to circuit 961 (WH/PK).

The LED on the switch will also illuminate for 3 seconds when the ignition key is turned to the RUN position. This is to verify (prove out) that the LED and the related circuits are working.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LCM
- IC

**PINPOINT TEST J: THE LED ON THE STABILITY/TRACTION CONTROL SWITCH IS ALWAYS ILLUMINATED**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>J1 CHECK FOR DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - All Continuous Memory Diagnostic Trouble Codes (CMDTCs).</li> <li>• <b>Are any DTCs present in the LCM or PCM?</b></li> </ul>	<p><b>Yes</b> For PCM DTCs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) Manual.</p> <p>For LCM DTCs, REFER to the Master DTC Chart in <u>Section 419-10</u> .</p> <p><b>No</b> GO to <u>J2</u> .</p>
<b>J2 CHECK THE TRACTION CONTROL OFF INDICATOR (TRAC OFF) ACTIVE COMMAND</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - LCM .</li> <li>• Toggle the TRAC OFF active command OFF.</li> <li>• <b>Does the traction control switch indicator turn OFF?</b></li> </ul>	<p><b>Yes</b> GO to <u>J3</u> .</p> <p><b>No</b> GO to <u>J4</u> .</p>
<b>J3 CHECK THE TRACTION CONTROL SWITCH STATUS (TCSW) PID</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DataLogger - LCM .</li> <li>• Monitor the TCSW PID while pressing and releasing the traction control switch.</li> <li>• <b>Does the PID agree with the switch position?</b></li> </ul>	<p><b>Yes</b> GO to <u>J5</u> .</p> <p><b>No</b> GO to <u>Pinpoint Test I</u> .</p>

<b>J4 CHECK THE SWITCH INDICATOR CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145A.</li> <li>• Ignition ON.</li> <li>• <b>Does the switch indicator continue to illuminate?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 961 (WH/PK). CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>J5</u> .</p>
<b>J5 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> <li>◆ spread terminals.</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>

**Pinpoint Test K: The LED on the Stability/Traction Control Switch Is Never Illuminated**

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

**Normal Operation**

The LED on the stability/traction control switch is controlled by the Lighting Control Module (LCM). When the Engine Only Traction Control (EOTC) system is disabled through the use of the stability/traction control switch, the PCM sends a message to the Instrument Cluster (IC) along the High Speed Controller Area Network (HS-CAN) bus. The IC will relay this message to the LCM over the Standard Corporate Protocol (SCP) bus. When the LCM receives this message it will illuminate the indicator on the stability/traction control switch by applying voltage to circuit 961 (WH/PK).

The LED on the switch will also illuminate for 3 seconds when the ignition key is turned to the RUN position. This is to verify (prove out) that the LED and the related circuits are working.

**This pinpoint test is intended to diagnose the following:**

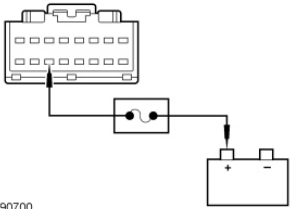
- Wiring, terminals or connectors
- LCM
- Traction control switch

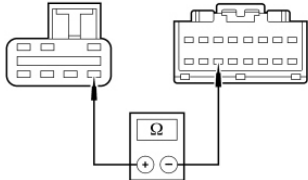
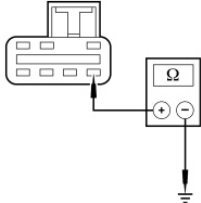
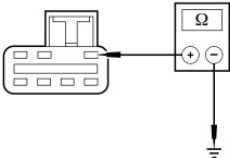
**PINPOINT TEST K: THE LED ON THE STABILITY/TRACTION CONTROL SWITCH IS NEVER ILLUMINATED**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>K1 CHECK THE DTCs FROM THE SELF-TEST</b>	

PINPOINT TEST J: THE LED ON THE STABILITY/TRACTION CONTROL SWITCH IS ALWAYS ILLUMINATED

<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - All Continuous Memory Diagnostic Trouble Codes (CMDTCs).</li> <li>• <b>Are any DTCs present in the PCM, ABS module, LCM or IC ?</b></li> </ul>	<p><b>Yes</b> For PCM DTCs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) Manual to diagnose the powertrain concern.</p> <p>For ABS module DTCs, REFER to the ABS DTC Chart in this section.</p> <p>For LCM and IC DTCs, REFER to the Master DTC Chart in <a href="#">Section 419-10</a> .</p> <p><b>No</b> GO to <a href="#">K2</a> .</p>
<b>K2 CHECK THE PROVE OUT OF THE INDICATOR ON THE SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• <b>Does the indicator on the switch prove out for 3 seconds?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">Pinpoint Test I</a> .</p> <p><b>No</b> GO to <a href="#">K3</a> .</p>
<b>K3 ISOLATE THE SWITCH INDICATOR</b>	
<p><b>NOTE:</b> To access the LCM connector, remove the LH instrument panel finish panel.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Connect a fused jumper wire between the battery positive terminal and LCM C2145a-14, circuit 961 (WH/PK), harness side.</li> </ul>  <p>N0090700</p> <p>• <b>Does the switch indicator illuminate?</b></p>	<p><b>Yes</b> GO to <a href="#">K7</a> .</p> <p><b>No</b> GO to <a href="#">K4</a> .</p>
<b>K4 CHECK THE SWITCH INDICATOR CONTROL CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Stability/Traction Control Switch C280.</li> <li>• Measure the resistance between stability/traction control switch C280-4, circuit 961 (WH/PK), harness side and LCM C2145a-14, circuit 961 (WH/PK), harness side.</li> </ul>	<p><b>Yes</b> GO to <a href="#">K5</a> .</p> <p><b>No</b> REPAIR circuit 961 (WH/PK). CLEAR the DTCs. REPEAT the self-test.</p>

 <p>N0090701</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<p><b>K5 CHECK THE SWITCH INDICATOR CONTROL CIRCUIT FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between stability/traction control switch C280-4, circuit 961 (WH/PK), harness side and ground.</li> </ul>  <p>N0090702</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>K6</b> .</p> <p><b>No</b> REPAIR circuit 961 (WH/PK). CLEAR the DTCs. REPEAT the self-test.</p>
<p><b>K6 CHECK THE SWITCH INDICATOR GROUND CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between stability/traction control switch C280-7, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0090703</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new stability/traction control switch. REFER to <u>Stability/Traction Control Switch</u> in this section.</p> <p><b>No</b> REPAIR circuit 57 (BK). CLEAR the DTCs. REPEAT the self-test.</p>
<p><b>K7 CHECK FOR CORRECT LCM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> <li>◆ spread terminals.</li> </ul> </li> <li>• Connect all LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> .</p> <p><b>No</b> The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Is the concern still present?</li> </ul> |  |
|---|--|

**Pinpoint Test L: The Engine Only Traction Control (EOTC) System is Inoperative**

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

**Normal Operation**

The Engine Only Traction Control (EOTC) is controlled by the PCM, the PCM utilizes the ABS module for wheel speed information only. When the PCM detects a wheel spinning excessively, it will assist with traction control by adjusting engine timing and decreasing fuel injector pulses.

The EOTC system can be disabled by pressing the stability/traction control switch located in the instrument panel. The switch is hardwired to the PCM. Fused ignition voltage is sent to the stability/traction control switch along circuit 640 (RD/YE) from Central Junction Box (CJB) fuse 26 (10A). When the switch is pressed, this voltage is sent to the PCM along circuit 959 (GY). When the PCM receives this voltage it will disable the EOTC system and send a message to the Instrument Cluster (IC) and the Lighting Control Module (LCM) along the High Speed Controller Area Network (HS-CAN) bus.

If wheel speed sensor DTCs are present in the ABS module or communication DTCs are present in the IC , PCM or ABS module, the EOTC system will also be disabled. When the system is disabled due to DTCs being present, both the ABS warning indicator and the stability/traction control indicator will be illuminated.

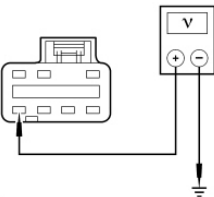
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Stability/traction control switch
- PCM
- IC
- ABS module

**PINPOINT TEST L: THE ENGINE ONLY TRACTION CONTROL (EOTC) SYSTEM IS INOPERATIVE**

**NOTICE:** The Flex Probe Kit must be used for all test connections. Use of standard multi-meter probes may damage wiring terminals.

Test Step	Result / Action to Take
<b>L1 VERIFY THAT THE SYSTEM CAN BE ENABLED/DISABLED BY THE STABILITY/TRACTION CONTROL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Test drive the vehicle, press the stability/traction control switch and verify that the EOTC system can be enabled/disabled by the switch.</li> <li>• <b>Can the EOTC system be enabled/disabled by the switch?</b></li> </ul>	<p><b>Yes</b> EXPLAIN correct system operation to the customer.</p> <p><b>No</b> GO to <u>L2</u> .</p>
<b>L2 CHECK FOR ABS MODULE, PCM AND IC DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> </ul>	<p><b>Yes</b> For PCM DTCs, REFER to the Powertrain</p>

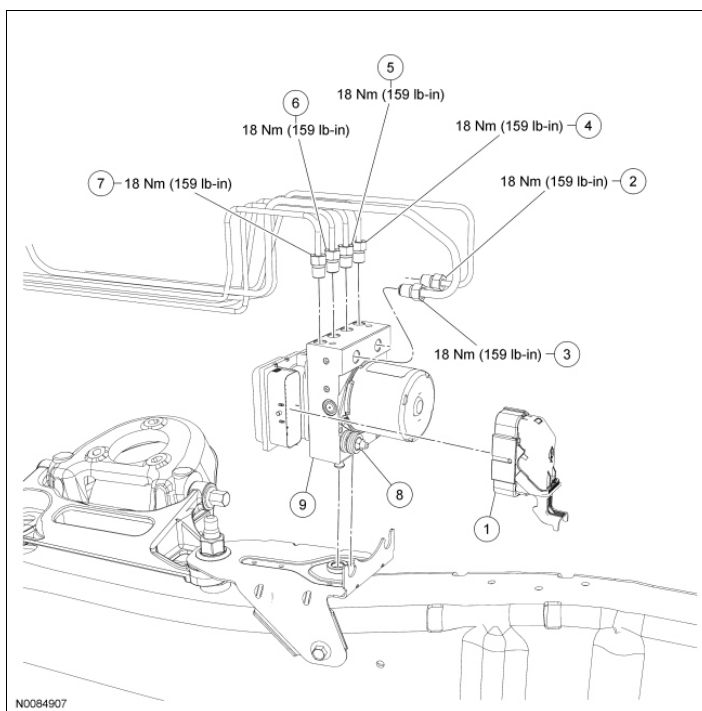
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self Test - All Continuous Memory Diagnostic Trouble Codes (CMDTCs).</li> <li>• <b>Are any DTCs present in the PCM, IC or ABS module?</b></li> </ul>	<p>Control/Emissions Diagnosis (PC/ED) Manual.</p> <p>For IC DTCs, REFER to the DTC Chart in <u>Section 419-10</u> .</p> <p>For ABS module DTCs, GO to the ABS Module DTC Chart.</p> <p><b>No</b> GO to <u>L3</u> .</p>
<p><b>L3 VERIFY THAT THE PCM IS CONFIGURED FOR EOTC</b></p>	
<ul style="list-style-type: none"> <li>• Configure the PCM, refer to Programmable Module Installation (PMI) in <u>Section 418-01</u> .</li> <li>• Test drive the vehicle and verify that the EOTC system operates correctly.</li> <li>• <b>Does the EOTC system operate correctly?</b></li> </ul>	<p><b>Yes</b> Return the vehicle to the customer, the concern was due to improper or incomplete PCM configuration.</p> <p><b>No</b> GO to <u>L4</u> .</p>
<p><b>L4 CHECK THE SWITCH CONTROL CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between stability/traction control switch C280-1, circuit 959 (GY), harness side and ground.</li> </ul>  <p>N0093922</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 959 (GY). TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new stability/traction control switch. REFER to <u>Stability/Traction Control Switch</u> in this section. TEST the system for normal operation.</p>



**Hydraulic Control Unit (HCU)**

## Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1-C (US); CPM-1-C (Canada)	WSS-M6C62-A or WSS-M6C65-A1



Item	Part Number	Description
1	-	ABS module electrical connector (part of 14290)
2	-	Master cylinder secondary brake tube fitting (part of 2C296)
3	-	Master cylinder primary brake tube fitting (part of 2C296)
4	-	LH front brake tube fitting (part of 2C296)
5	-	RH front brake tube fitting (part of 2C296)
6	-	RH rear brake tube fitting (part of 2C296)
7	-	LH rear brake tube fitting (part of 2C296)
8	3B676	Hydraulic Control Unit (HCU)-to-mounting bracket nut (2 required)
9	2C346	HCU (includes ABS module)

**Removal and Installation**



**⚠ WARNING:** Do not use any fluid other than clean brake fluid meeting manufacturer's specification. Additionally, do not use brake fluid that has been previously drained. Following these instructions will help prevent system contamination, brake component damage and the risk of serious personal injury.

**⚠ WARNING:** Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Do not spill brake fluid on painted or plastic surfaces or damage to the surface may occur. If brake fluid is spilled onto a painted or plastic surface, immediately wash the surface with water.

1. Remove the Air Cleaner (ACL) assembly. For additional information, refer to Section 303-12 .

2. **NOTICE:** Clean and plug each port of the Hydraulic Control Unit (HCU) to prevent contaminates from entering the HCU or damage to the HCU may occur.

Disconnect the 6 brake tube-to-Hydraulic Control Unit (HCU) fittings.

- To install, tighten to 18 Nm (159 lb-in).

3. Disconnect the ABS module electrical connector.

4. Remove the 2 HCU -to-mounting bracket nuts.

- To install, tighten to 9 Nm (80 lb-in).


5. Remove the HCU .

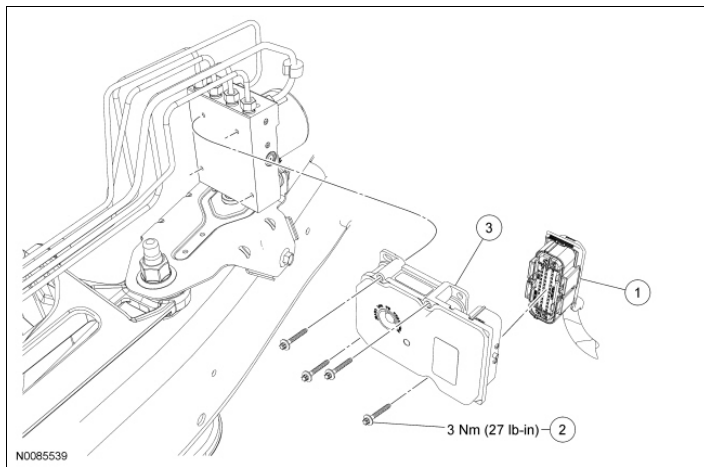
6. To install, reverse the removal procedure.

7. Bleed the brake system. For additional information, refer to Section 206-00 .

**Anti-Lock Brake System (ABS) Module**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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Item	Part Number	Description
1	-	ABS module electrical connector (part of 14290)
2	2C331	ABS module screw (4 required)
3	2C219	ABS module

**Removal and Installation**

**NOTICE:** Electronic modules are sensitive to electrical charges. The ABS module can be damaged if exposed to these charges.

**NOTICE:** Do not allow any brake fluid or foreign material to enter the mating side of the ABS module or damage to the solenoids can occur.

1. If installing a new ABS module, carry out the steps necessary to prepare for Programmable Module Installation (PMI). For additional information, refer to [Section 418-01](#) .
2. Remove the Air Cleaner (ACL). For additional information, refer to [Section 303-12](#) .
3. Disconnect the ABS module electrical connector.
4. **NOTICE:** Care must be taken when removing the module from the Hydraulic Control Unit (HCU) or damage to the component may occur.

Remove the 4 screws and the ABS module.

- To install, tighten to 3 Nm (27 lb-in).

5. **NOTE:** Make sure that the ABS module-to-Hydraulic Control Unit (HCU) gasket surfaces are clean and that the gasket is correctly installed.

To install, reverse the removal procedure.

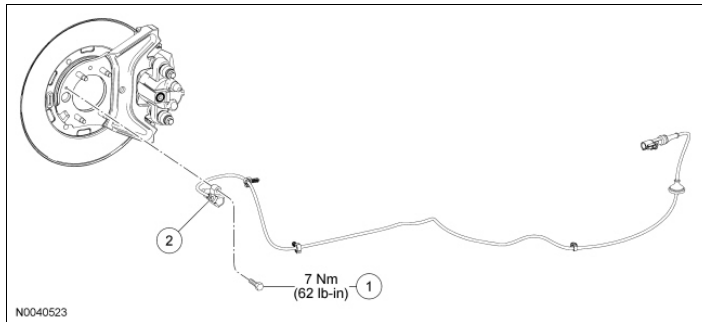
6. If a new ABS module was installed, carry out the appropriate steps necessary to complete PMI . For additional information, refer to Section 418-01 .
-

## **Wheel Speed Sensor - Front**

### **Removal and Installation**

1. For additional information, refer to Wheel Bearing and Wheel Hub in Section 204-01 .
-

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**Wheel Speed Sensor - Rear****Removal and Installation**

Item	Part Number	Description
1	W707231	Rear wheel speed sensor bolt
2	2C190	Rear wheel speed sensor

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

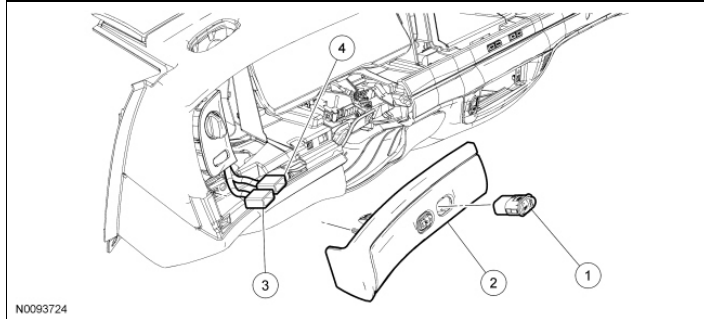
Remove the rear seat cushion. For additional information, refer to [Section 501-10](#) .

2. Disconnect the rear wheel speed sensor electrical connector.
3. Push the wheel speed sensor harness grommet through the passenger compartment floor.
4. Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .
5. Disconnect the wheel speed sensor harness clips.
6. Remove the rear wheel speed sensor bolt and the sensor.
  - To install, tighten to 7 Nm (62 lb-in).
7. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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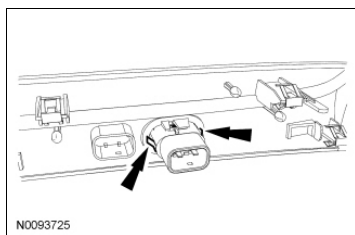


**Stability/Traction Control Switch**

Item	Part Number	Description
1	2C335	Stability/traction control switch
2	54046A63	LH instrument panel finish panel
3	-	Adjustable pedal electrical connector (part of 14401)
4	-	Stability/traction control switch electrical connector (part of 14401)

**Removal and Installation**

1. Remove the LH instrument panel trim panel in the following sequence:
  1. Pull out to release the retaining clips.
  2. Disconnect the stability/traction control switch electrical connector.
  3. If equipped, disconnect the adjustable pedal switch electrical connector.
2. Depress the 2 tabs and remove stability/traction control switch from the LH instrument panel trim panel.



3. To install, reverse the removal procedure.





SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
SPECIFICATIONS

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

Material

Item	Specification	Fill Capacity
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	-	-
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV	Police applications 12.1L (12.8 qt) Non-Police applications 13.1L (13.9 qt)
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B	-

General Specifications

Item	Specification
<b>Transmission Fluid</b>	
MERCON® LV is not interchangeable with any other transmission fluids. Check the transmission fluid level indicator to determine the correct fluid and refer to the Owner's Literature to determine the correct service interval for the vehicle.	

Assembly Weight

Description	Specification
-------------	---------------

Transmission	92 kg (202 lb)
--------------	----------------

**Line Pressure Chart**

Application	Range	Idle		WOT	
		EPC	Line Pressure	EPC	Line Pressure
All	P, N	34-276 kPa (5-40 psi)	276-689 kPa (40-100 psi)	N/A	N/A
	O/D , 2, 1	34-276 kPa (5-40 psi)	276-689 kPa (40-100 psi)	689-793 kPa (100-115 psi)	1,172-1,586 kPa (170-230 psi)
	R	172-207 kPa (25-30 psi)	483-862 kPa (70-125 psi)	586-655 kPa (85-95 psi)	1,124-2,068 kPa (250-300 psi)

**Band and Clutch Application Chart A**

Gear	Overdrive Band	Intermediate Clutch	Low/ Reverse Band	Reverse Clutch	Forward Clutch	Direct Clutch
Reverse			A	A		
1st Gear Manual Low			A		A	
2nd Gear Manual	A	A			A	
1st Gear (D) Overdrive (O/D)					A	
2nd Gear (D) O/D		A			A	
3rd Gear (D) O/D		A			A	A
4th Gear (D) O/D	A	A				A

A = Applied

**Band and Clutch Application Chart B**

Gear	Intermediate One-Way Clutch	Low One-Way Clutch	Solenoid States		
			SSA	SSB	TCC
Park			ON	OFF	HD
Reverse		NE	ON	OFF	HD
Neutral			ON	OFF	HD
1st Gear Manual Low		H	ON	OFF	HD

## 2010 Crown Victoria, Grand Marquis Workshop Manual

2nd Gear Manual	H	OR	OFF	OFF	EC
1st Gear (D) Overdrive (O/D)		H	ON	OFF	HD
2nd Gear (D) O/D	H	OR	OFF	OFF	EC
3rd Gear (D) O/D	OR	OR	OFF	ON	EC
4th Gear (D) O/D	NE	OR	ON	ON	EC

HD = Hydraulically Disabled

NE = No Effect

H = Hold

EC = Electronically Controlled

OR = Overrunning

### Stall Speed

Application	Min	Max
4.6L 2V	2,065	2,409
4.6L Police applications	2,377	2,757

### Shift Speed Chart

**NOTE:** Shift speed ranges are approximate for all applications. For specific applications (engine, axle ratio and application), refer to the Automatic Transmission Specification booklet. Do not exceed local speed laws.

Throttle Position	Shift	mph	km/h
Closed Throttle	4-3	14-38	23-61
	3-2	11-21	18-34
	2-1	6-12	10-19
Light Throttle	1-2	8-22	13-35
Voltage	2-3	14-36	23-58
1.25 Volts	3-4	28-54	45-87
Wide Open Throttle	1-2	37-54	60-87
	2-3	73-93	117-150
	3-2	67-84	108-135
	2-1	29-36	47-58

### Sensor Resistance Readings

Component	Readings (ohm)
Shift Solenoid A (SSA)	20-30 ohms
Shift Solenoid B (SSB)	20-30 ohms
Electronic Pressure Control (EPC)	2.48-5.66 ohms
Torque Converter Clutch (TCC)	10-16 ohms
Output Shaft Speed (OSS)	400-500 ohms
Turbine Shaft Speed (TSS)	480-590 ohms

### Solenoid Operation Chart

Selector Lever Position	PCM Commanded Gear	Solenoids		
		SSA	SSB	TCC
P/R/N	1	ON	OFF	HD
(D)	1	ON	OFF	HD
(D)	2	OFF	OFF	EC
(D)	3	OFF	ON	EC
(D)	4	ON	ON	EC
(D)OFF 1	1	ON	OFF	HD
(D)OFF 2	2	OFF	OFF	EC
(D)OFF 3	3	OFF	ON	EC
Manual 2	2	OFF	OFF	EC
Manual 1	1	ON	OFF	HD
1 <sup>a</sup>	2	OFF	OFF	EC

<sup>a</sup> When a manual pull-in occurs above a calibrated speed, the transmission will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

EC = Electronically Controlled

HD = Hydraulically Disabled

Gear Ratio	
1st	2.84 to 1
2nd	1.55 to 1
3rd	1.00 to 1
4th	0.70 to 1
Reverse	2.32 to 1

### Selective Thrust Washer - No. 1 (7D014)

Item	Specification
Green thickness	1.217-1.371 mm (0.050-0.054 in)
Yellow thickness	1.727-1.828 mm (0.068-0.072 in)
Natural thickness	2.159-2.260 mm (0.085-0.089 in)
Red thickness	2.590-2.692 mm (0.102-0.106 in)
Blue thickness	3.022-3.124 mm (0.119-0.123 in)

**Forward Clutch Pack**

Item	Specification
Clearance	1.82-2.29 mm (0.072-0.090 in)
Snap ring thickness	1.72-1.82 mm (0.068-0.072 in)
	1.93-2.03 mm (0.076-0.080 in)
	2.13-2.23 mm (0.084-0.088 in)
	2.33-2.43 mm (0.092-0.096 in)

**Reverse Clutch Pack**

Item	Specification
Clearance	1.27-1.94 mm (0.050-0.076 in)
Snap ring thickness	1.524-1.625 mm (0.060-0.064 in)
	1.880-1.981 mm (0.074-0.078 in)
	2.235-2.337 mm (0.088-0.092 in)
	2.591-2.692 mm (0.102-0.106 in)

**Direct Clutch Pack**

Item	Specification
Clearance	1.574-2.159 mm (0.062-0.085 in)
Snap ring thickness	1.270-1.372 mm (0.050-0.054 in)
	1.625-1.727 mm (0.064-0.068 in)
	1.981-2.083 mm (0.078-0.082 in)
	2.337-2.438 mm (0.092-0.096 in)

**Intermediate Clutch Pack**

Item	Specification
Clearance	41.7322-42.5958 mm (1.643-1.677 in)
Selective steel plates	1.702-1.803 mm (0.067-0.071 in)
	1.956-2.057 mm (0.077-0.081 in)
	2.210-2.311 mm (0.087-0.091 in)
	2.464-2.565 mm (0.097-0.101 in)

**Torque Specifications**

Description	Nm	lb-ft	lb-in
Cooler tube bracket bolt	15	-	133
Electronic Pressure Control (EPC) solenoid bracket	10	-	89
Extension housing bolts and stud bolts	55	41	-
Fluid cooler tube case fittings	21	15	-
Front pump bolts <sup>a</sup>	-	-	-
Front pump support bolts	23	17	-
Ground wire	23	17	-
Main control valve body bolts <sup>a</sup>	-	-	-
Main control valve body cover plate bolts <sup>a</sup>	-	-	-
Main control valve body reinforcement plates	10	-	89
Manual control valve detent lever spring bolt	10	-	89
Manual lever shaft inner nut	32	24	-
Output Shaft Speed (OSS) sensor bolt	12	-	106
Pressure tap plugs	12	-	106
Selector lever cable bracket	14	-	124
Selector lever cable nut	30	22	-
Separator plate bolt	35	26	-
Servo piston installer bolt	5.6	-	50
Starter B+ cable	12	-	106
Starter bolts	25	18	-
Starter solenoid nut (small)	6	-	53
Torque Converter Clutch (TCC) solenoid bolt	10	-	89
Torque converter nuts	36	27	-
Transmission Air Test Plate	10	-	89
Transmission filler tube bolt	48	35	-

Transmission fluid cooler tubes	20	-	177
Transmission fluid pan bolts	14	-	124
Transmission inspection cover bolts	35	26	-
Transmission insulator and retainer bolts	90	66	-
Transmission insulator and retainer nuts	30	22	-
Transmission Range (TR) sensor bolts <sup>a</sup>	-	-	-
Transmission retaining bolts	48	35	-
Transmission support crossmember bolts	70	52	-
Turbine Shaft Speed (TSS) sensor bolt	11	-	97

<sup>a</sup> Refer to the procedure in this section.

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SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E

2010 Crown Victoria, Grand Marquis  
Workshop Manual

DESCRIPTION AND OPERATION

Procedure revision date: 04/19/2011

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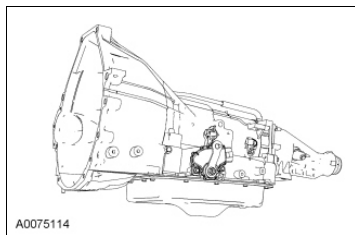
## Transmission Description

This transmission has the following features:

- Wide ratio gears
- Four speeds
- Rear Wheel Drive (RWD)
- Automatic
- Electronic shift
- Torque Converter Clutch (TCC) control
- Line pressure controls

The transmission uses a Ravigneaux-style double-pinion gearset with 2 bands, 1 one-way roller clutch, 1 rocker clutch and 4 friction clutches to produce 4 forward gears and reverse.

### Automatic Transmission





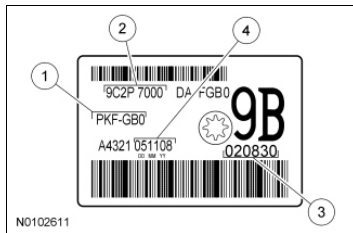
SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E2010 Crown Victoria, Grand Marquis  
Workshop Manual

## DESCRIPTION AND OPERATION

Procedure revision date: 08/19/2009

**Identification Tags**

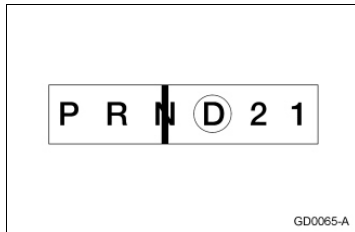
All vehicles come equipped with a Safety Compliance Certification Label. The location on the label marked TR is reserved for the transmission code. To determine the correct transmission for this vehicle, refer to the Owner's Literature, Transmission Code Designations. All transmissions are equipped with an identification tag located on the transmission case. For model number, transmission part number, serial number and build date, refer to the transmission identification tag located on the transmission case.

**Identification Tag**

Item	Description
1	Model number
2	Transmission part number
3	Serial number
4	Build date

## Range Selection

The transmission has 6 selector lever positions: P, R, N, (D), 2 and 1.



### Park

In the PARK position:

- there is no powerflow through the transmission.
- the park pawl locks the output shaft to the case.
- the ignition key may be removed.
- the engine may be started.

### Reverse

In the REVERSE position:

- the vehicle may be operated in a rearward direction, at a reduced gear ratio.
- engine braking will occur.

### Neutral

In the NEUTRAL position:

- there is no powerflow through the transmission.
- the output shaft is not held and is free to turn.
- the engine may be started.

### Overdrive (D)

OVERDRIVE (D) is the normal position for most forward driving.

The (D) position provides:

- automatic shifts.
- apply and release of the Torque Converter Clutch (TCC).
- maximum fuel economy during normal operation.

### **Position 2 - 2nd Gear**

This position provides:

- second gear start and hold.
- the TCC may apply and release.
- improved traction and engine braking on slippery roads.
- engine braking for descending steep grades.

### **Position 1 - 1st Gear**

If this position is selected at normal road speeds, the transmission will shift into 2nd gear, then into 1st when the vehicle reaches a speed below approximately 45 km/h (28 mph).

This position provides:

- first gear operation only.
  - engine braking for descending steep grades.
-

## **Shift Patterns**

### **Upshifts**

Transmission upshifting is controlled by the PCM. The PCM receives inputs from various engine or vehicle sensors and driver demands to control shift scheduling, shift feel and Torque Converter Clutch (TCC) operation.

### **Downshifts**

Under certain conditions, the transmission will downshift automatically to a lower gear range (without moving the selector lever). There are 3 categories of automatic downshifts: coastdown, torque demand and forced or kickdown shifts.

#### **Coastdown**

The coastdown downshift occurs when the vehicle is coasting down to a stop.

#### **Torque Demand**

The torque demand downshift occurs (automatically) during part throttle acceleration when the demand for torque is greater than the engine can provide at that gear ratio. If applied, the transmission will disengage the TCC to provide added acceleration.

#### **Kickdown**

For maximum acceleration, the driver can force a downshift by pressing the accelerator pedal to the floor. A forced downshift into a lower gear is possible below calibrated speeds. Specifications for downshift speeds are subject to variations due to tire size, engine and transmission calibration requirements.

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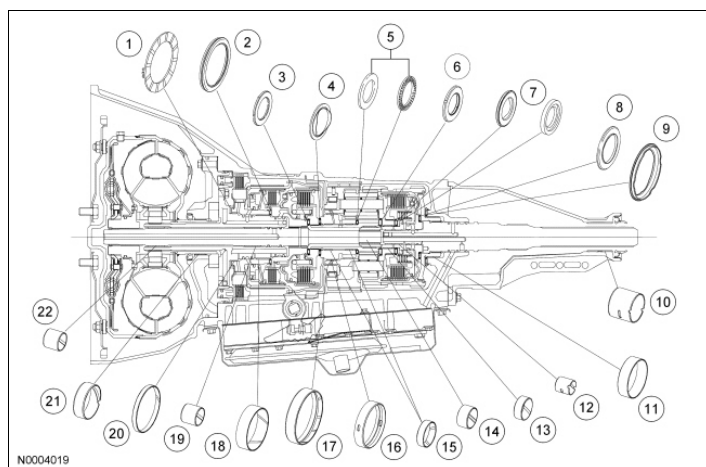


SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E

## DESCRIPTION AND OPERATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

**Bushings, Bearing and Thrust Washer Locator**

Item	Part Number	Description
1	7D014	Pump No. 1 thrust washer (select fit)
2	7A166	Forward clutch No. 2 bearing and race assembly
3	7F231	Forward clutch bearing and race assembly - front No. 3
4	7C096	Forward clutch hub bearing and race assembly No. 4
5	7D234, 7D235	Forward clutch sun gear bearing and race assembly No. 5 (2 piece)
6	7F241	No. 6 bearing and race (part of 7A398 planetary assembly)
7	7F243	Direct clutch inner bearing, race assembly No. 7 and direct clutch inner bearing support No. 7
8	7F240	Direct clutch outer bearing and race assembly No. 8
9	7F242	Outer bearing and race assembly - rear No. 9
10	-	Extension bushing (part of 7A039)
11	7025	Case bushing
12	7B233	Output shaft bushing
13	7B375	Planet carrier bushing - rear
14	7F209	Forward clutch sun gear bushing
15	7N193	Reverse clutch sun gear bushing
16	7B374	Carrier bushing - front
17	7A132	Planetary support bushing
18	7F218	Reverse clutch drum bushing - rear
19	7B261	Front pump support bushing
20	7F217	Reverse clutch drum bushing - front
21	7B258	Front pump bushing
22	7B261	Front pump support bushing

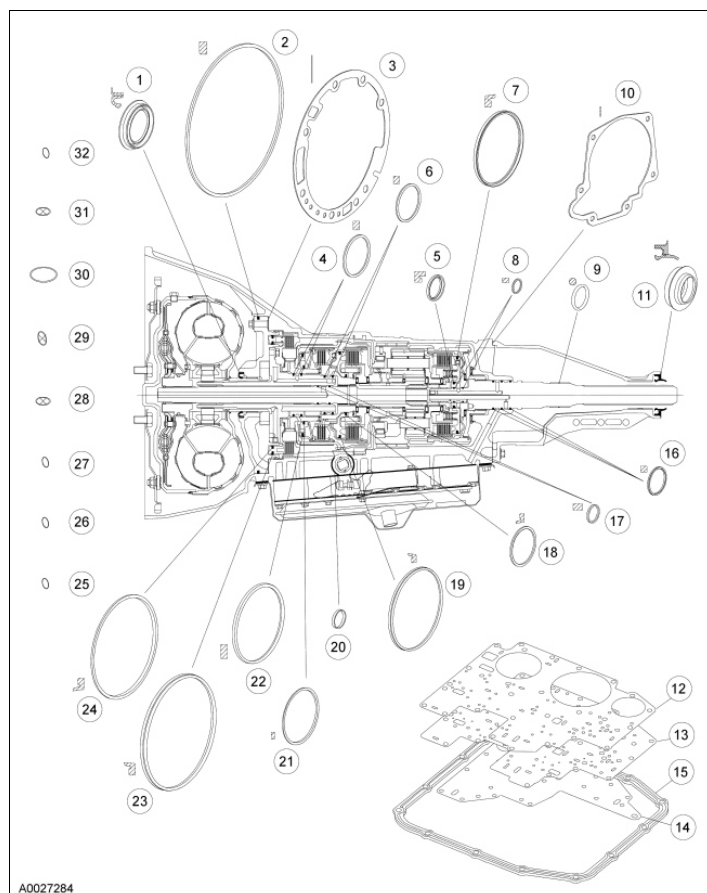


SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E

## DESCRIPTION AND OPERATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

**Seals, Rings and Gasket Locator**

Item	Part Number	Description
1	7A248	Front pump seal assembly
2	7A248	Front pump seal
3	7A136	Front pump gasket
4	7D020	Reverse clutch cylinder seal (2 required)
5	7C099	Direct clutch piston inner seal
6	7D019	Forward clutch cylinder
7	7A548	Direct clutch piston outer seal
8	7F274	Output shaft to direct clutch cylinder seal (2 required)
9	87054-S94	O-ring seal (piloted) (model dependent)
10	7086	Extension gasket
11	7052	Extension housing seal assembly
12	7C155	Control valve body upper gasket
13	7D100	Valve body separator plate lower gasket
14	7H173	Valve body cover plate gasket
15	7A191	Transmission pan-to-case gasket
16	7F273	Output shaft-to-case seal (3 required)



17	7B497	Input shaft seal (2 required)
18	7C099	Forward clutch piston inner seal
19	7A548	Forward clutch piston outer seal
20	7B498	Manual control lever seal assembly
21	7D403	Reverse clutch piston outer seal
22	7D404	Reverse clutch piston inner seal
23	7F224	Intermediate clutch piston outer seal
24	7F225	Intermediate clutch piston inner seal
25	391308-S	Fill tube level indicator seal
26	7Z484	Torque Converter Clutch (TCC) solenoid seal (large)
27	7Z136	TCC solenoid seal (small)
28	7Z484	Shift solenoid seal (2 required)
29	N811757-S100	Output Shaft Speed (OSS) sensor seal
30	7Z276	Bulkhead seal
31	N805862-S	Pressure control solenoid seal (large)
32	391131	Pressure control solenoid seal (small)

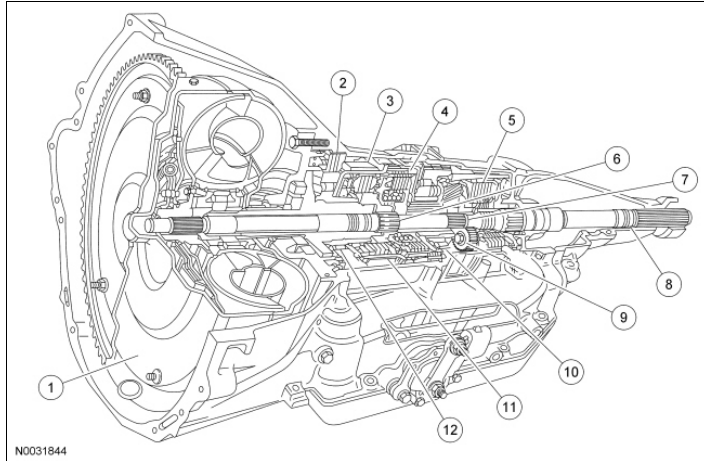
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SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E

## DESCRIPTION AND OPERATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

**Main Components and Functions****Transmission Main Components - Sectional View**

Item	Part Number	Description
1	7902	Torque converter
2	7B164	Intermediate clutch (friction)
3	7B164	Reverse clutch (friction)
4	7B164	Forward clutch (friction)
5	7B164	Direct clutch (friction)
6	7F207	Forward clutch cylinder and shaft
7	7F351	Shaft - intermediate stub
8	7060	Output shaft
9	7A089	Planetary One-Way Clutch (OWC)
10	7D095	Reverse clutch band
11	7F196	Overdrive (O/D) band
12	7A089	Intermediate OWC



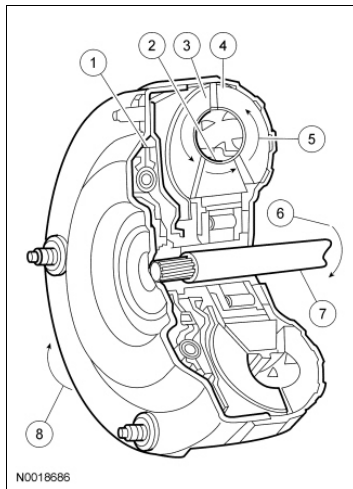
**Torque Converter**

The torque converter transmits and multiplies torque. The torque converter is a 4-element device:

- Impeller assembly
- Turbine assembly
- Reactor assembly
- Clutch and damper assembly

The standard torque converter components operate as follows:

- Rotation of the converter housing and impeller set the transmission fluid in motion.
- The turbine reacts to the transmission fluid motion from the impeller, transferring rotation to the geartrain through the input shaft.
- The reactor redirects transmission fluid going back into the impeller, allowing for torque multiplication.
- The clutch and damper assembly dampens powertrain torsional vibration and provides a direct mechanical connection for improved efficiency.
- Power is transmitted from the torque converter to the planetary gearsets and other components through the input shaft.



Item	Description
1	Converter clutch and damper (part of 7902)
2	Reactor (part of 7902)
3	Turbine (part of 7902)
4	Impeller (part of 7902)
5	Transmission fluid motion
6	Transmission input rotation
7	Input shaft
8	Engine rotation



---

**Geartrain**

Power is transmitted from the torque converter to the Ravigneaux geartrain components through the input shaft and forward clutch cylinder.

- The geartrain contains a Ravigneaux planetary set connected by dual pinion gears.
- By holding or driving certain components of the gearset, 4 forward ratios and one reverse ratio are obtained and transmitted to the output shaft. The ratios are as follows:

<b>Gear Ratio</b>	
1st	2.84 to 1
2nd	1.55 to 1
3rd	1.00 to 1
4th	0.70 to 1
Reverse	2.32 to 1

- Components of the geartrain can be held by bands or clutches and driven by clutches only.

This transmission uses:

- two bands.
- two One-Way Clutch (OWC) (one roller, one rocker).
- four friction clutches.

**Planetary Gearset**

The planetary gearset in the transmission is a Ravigneaux-type set consisting of the following components:

- Forward clutch sun gear
- Reverse clutch sun gear
- A pinion carrier
- Long and short pinions
- Output ring gear

Components are held or driven to produce forward and reverse gear ratios.

**Input Shaft**

The forward clutch cylinder and shaft transfers speed and torque from the converter turbine to the geartrain. This shaft is splined to the turbine on one end and to the forward clutch sun gear and stub shaft on the other end.

### **Stub Shaft**

The stub shaft transfers power from the input shaft to the planet carrier (through the direct clutch) during 3rd and 4th gear operation.

### **Output Shaft**

The output shaft provides torque to the driveshaft and rear axle assembly. It is driven by the ring gear of the planetary gearset.

---

## **Apply Components**

There are 8 apply components used to drive or hold the planetary gearset components.

### **Band - Overdrive (O/D)**

**NOTE:** For component location, refer to Transmission in this section.

The Overdrive (O/D) band holds the reverse clutch drum stationary in 4th gear and manual 2. This action causes the reverse sun gear to be held in these ranges.

### **Band - Low and Reverse**

**NOTE:** For component location, refer to Transmission in this section.

The low and reverse band holds the pinion carrier in reverse. The reverse band also applies in manual 1 position to provide engine braking.

### **Clutch - Intermediate**

**NOTE:** For component location, refer to Transmission in this section.

The intermediate clutch works with the intermediate One-Way Clutch (OWC) to hold the reverse sun gear stationary in 2nd gear. The intermediate clutch remains applied in 3rd and 4th gears, but does not transmit power.

### **Clutch - Forward**

**NOTE:** For component location, refer to Transmission in this section.

The forward clutch couples the forward clutch cylinder and input shaft to the forward sun gear in 1st, 2nd and 3rd gears. The forward clutch is not applied in 4th gear.

### **Clutch - Direct**

**NOTE:** For component location, refer to Transmission in this section.

The direct clutch couples the input shaft to the planet carrier through the stub shaft in 3rd and 4th gears.

### **Clutch - Reverse**

**NOTE:** For component location, refer to Transmission in this section.

The reverse clutch couples the input shaft to the reverse sun gear, applied in REVERSE range only.



### **One-Way Clutch (OWC) - Planetary (Low)**

**NOTE:** For component location, refer to Transmission in this section.

The planetary (low) OWC is a roller clutch that holds the planetary gearset in 1st gear, (D) and D ranges. During automatic coasting downshifts into 1st gear ((D) and D ranges), the planetary OWC freewheels so there is no engine braking.

### **One-Way Clutch (OWC) - Intermediate**

**NOTE:** For component location, refer to Transmission in this section.

The intermediate OWC works with the intermediate friction clutch to hold the reverse clutch drum and reverse sun gear stationary in 2nd gear during acceleration. The intermediate OWC freewheels in 3rd gear and during coasting in 2nd gear, (D) and D ranges.

---

## Hydraulic System

### Pump

The transmission uses a gerotor-type design front pump support and gear. The pump provides the volume of transmission fluid needed to charge the torque converter, main control assembly, cooling system and lube system. Pump pressure is regulated by the main regulator valve. The pump has an internal boost circuit which is more efficient at lower engine speeds.

### Transmission Fluid Filter

All transmission fluid drawn from the transmission fluid pan by the pump passes through the transmission fluid filter. The transmission fluid filter and its accompanying seal are part of the transmission fluid path from the sump (transmission fluid pan) to the pump.

### Main Control

The main control valve body contains 3 electronic solenoids:

- Two shift solenoids
- One Torque Converter Clutch (TCC) solenoid

### Accumulators

The transmission uses 2 accumulators:

- 1-2 Accumulator - The 1-2 accumulator is used to soften the 1-2 shift by absorbing some of the pressure directed to the intermediate clutch. Constant line pressure is applied to the middle section of the 1-2 accumulator piston, opposing the intermediate clutch pressure, until the pressure is high enough to overcome line pressure. The top of the piston is exhausted to the sump.
  - 2-3 Accumulator - The 2-3 accumulator is used to soften the 2-3 shift by absorbing some of the direct clutch pressure. Forward clutch pressure is applied to the top side of the 2-3 accumulator piston, holding the piston down until clutch pressure is high enough to overcome it. The middle section of the piston is exhausted to the sump.
-



## **Transmission Electronic Control System**

The PCM and its input/output network control the following transmission operations:

- Shift timing
- Line pressure (shift feel)
- Torque Converter Clutch (TCC)

The transmission control is separate from the engine control strategy in the PCM, although some of the input signals are shared. When determining the best operating strategy for transmission operation, the PCM uses input information from certain engine-related and driver-demand related sensors and switches.

In addition, the PCM receives input signals from transmission-related sensors and switches. The PCM also uses these inputs when determining transmission operating strategy.

Using all of these input signals, the PCM can determine when the time and conditions are right for a shift, or when to apply or release the TCC. The PCM will also determine the best line pressure needed to optimize shift feel. To accomplish this, the PCM uses hydraulic solenoids to control transmission operation.

The following provides a brief description of each of the sensors and actuators used to control transmission operation.

### **PCM**

The operation of the transmission is controlled by the PCM. Many input sensors provide information to the PCM. The PCM then controls actuators which determine transmission operation.

### **A/C Clutch**

An electromagnetic clutch is energized when the A/C cycling pressure switch closes. The switch is located on the suction side of the accumulator/drier. The closing of the switch completes the circuit to the clutch and draws it into engagement with the compressor driveshaft. When the A/C clutch is engaged, the Electronic Pressure Control (EPC) solenoid is adjusted by the PCM to compensate for additional engine load.

### **Brake Pedal Position (BPP) Switch**

The Brake Pedal Position (BPP) switch sends a voltage input to the Lighting Control Module (LCM) which then sends a network signal to the PCM that the brakes are applied. If engaged, the TCC disengages when the brakes are applied. The BPP switch closes when the brakes are applied and opens when they are released.

### **Cylinder Head Temperature (CHT) Sensor**

The Cylinder Head Temperature (CHT) sensor is a thermistor device in which resistance changes with the temperature. The resistance of the thermistor decreases as temperature increases, and the resistance increases as the temperature decreases. The varying resistance affects the voltage drop across the sensor and provides an electrical input to the PCM corresponding to temperature.

### **Electronic Pressure Control (EPC) Solenoid**

The EPC solenoid regulates transmission pressure. EPC valve pressure is used to control line pressure.

### **Ignition Coil - Coil On Plug**

The engine uses 8 separate coil per plug units. Each coil per plug unit is controlled by the PCM.

Each coil per plug unit is mounted directly above each spark plug and activates its own spark plug in the correct sequence as controlled by the PCM.

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for information on the ignition system.

### **Intake Air Temperature (IAT) Sensor**

The Intake Air Temperature (IAT) sensor provides an electrical input to the PCM corresponding to air temperature. The IAT sensor is installed in the Air Cleaner (ACL) outlet tube. The IAT sensor is used in determining EPC valve pressure which is used to control line pressure.

### **Mass Air Flow (MAF) Sensor**

The Mass Air Flow (MAF) sensor measures the speed and density of air flowing into the intake manifold. For transmission strategies, the MAF sensor is used to regulate EPC , shift time and TCC scheduling.

### **Transmission Control Switch (TCS) and Transmission Control Indicator Lamp (TCIL)**

The Transmission Control Switch (TCS) is a momentary contact switch. When the switch is pressed, a signal is sent to the PCM to allow automatic shifts from 1st through 4th gears or 1st through 3rd gears only. The PCM energizes the Transmission Control Indicator Lamp (TCIL) when the switch is off. The TCIL indicates Overdrive (O/D) cancel mode activated (lamp on). When the TCIL is flashing, it indicates the EPC or sensor failure.

### **Throttle Position (TP) Sensor**

The Throttle Position (TP) sensor is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends a voltage input to the PCM. The TP sensor is used for shift time, EPC valve pressure and TCC scheduling.

### **Transmission Range (TR) Sensor**

The Transmission Range (TR) sensor is located on the outside of the transmission at the manual lever. The TR sensor completes the start circuit in PARK and NEUTRAL, and the back-up lamp circuit in REVERSE. The TR sensor also opens/closes a set of 4 switches that are monitored by the PCM to determine the position of the manual control lever (P, R, N, (D), 2, 1).

### **Output Shaft Speed (OSS) Sensor**

The Output Shaft Speed (OSS) sensor is a magnetic pickup, located at the output shaft ring gear, that sends a signal to the PCM to indicate transmission OSS . The OSS sensor is used for TCC scheduling, shift time and to determine EPC valve pressure.

### **Turbine Shaft Speed (TSS) Sensor**

The Turbine Shaft Speed (TSS) sensor is a magnetic pickup that sends a signal to the PCM to indicate TSS . The TSS is mounted externally on the case. The PCM uses the TSS signal to help determine appropriate operating pressure and TCC scheduling.

### **Torque Converter Clutch (TCC) Solenoid**

The TCC solenoid is used to control the apply and release of the TCC .

### **Shift Solenoid A (SSA) and Shift Solenoid B (SSB)**

Two on/off shift solenoids provide gear selection of 1st through 4th gears by controlling the pressure to the 3 shift valves. One unit containing the 2 shift solenoids is located in the main control valve body. The shift solenoids are 2-way, normally open solenoids.

Selector Lever Position	PCM Commanded Gear	Solenoids		
		SSA	SSB	TCC
P/R/N	1	ON	OFF	HD
(D)	1	ON	OFF	HD
(D)	2	OFF	OFF	EC
(D)	3	OFF	ON	EC
(D)	4	ON	ON	EC
(D)OFF 1	1	ON	OFF	HD
(D)OFF 2	2	OFF	OFF	EC
(D)OFF 3	3	OFF	ON	EC
Manual 2	2	OFF	OFF	EC
Manual 1	1	ON	OFF	HD
1 <sup>a</sup>	2	OFF	OFF	EC

<sup>a</sup> When a manual pull-in occurs above a calibrated speed, the transmission will not downshift from the higher gear until the vehicle speed drops below this calibrated speed.

EC = Electronically Controlled

HD = Hydraulically Disabled

### **Transmission Fluid Temperature (TFT) Sensor**

The Transmission Fluid Temperature (TFT) sensor is connected to the transmission wire harness and is located on the main control valve body. It is a temperature-sensitive device called a thermistor. It sends a voltage signal to the PCM. The voltage signal varies with TFT. The PCM uses this signal to determine whether a cold start shift schedule is necessary. The shift schedule is compensated when the TFT is cold. The PCM also inhibits TCC operation at low TFT s and adjusts EPC valve pressure.

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## Diagnostic Strategy

Troubleshooting an electronically controlled automatic transmission is simplified by using the proven method of diagnosis. One of the most important things to remember is that there is a definite procedure to follow.

**NOTE:** Do not take any short cuts or assume that critical checks or adjustments have already been made.

Follow the procedures as written to avoid missing critical components or steps.

To correctly diagnose a concern have the following publications available:

- Transmission Reference Manual
- Powertrain Control/Emissions Diagnosis (PC/ED) manual
- TSBs
- Wiring Diagrams manual

These publications provide the information required when diagnosing transmission concerns.

Use the Diagnostic Flow Chart as a guide and follow the steps as indicated.

## Preliminary Inspection

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

- Know and understand the customer concern.
- Verify the concern by operating the vehicle.
- Check the transmission fluid levels and condition.
- Check for non-factory add-on items.
- Check selector lever linkages for correct adjustment.
- Check TSBs regarding the concern.

## Diagnostics

- Carry out On-Board Diagnostic (OBD) procedures Key ON Engine OFF (KOEO) and Key ON Engine Running (KOER).
- Record all DTCs.
- Repair all non-transmission codes first.
- Repair all transmission codes second.
- Clear all continuous codes and attempt to repeat them.
- Repair all continuous codes.
- If only pass codes are obtained, refer to Diagnosis By Symptom for further information and diagnosis.

Follow the diagnostic sequence to diagnose and repair the concern the first time.


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**Diagnostic Flow Chart**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

- Know and understand the customer concerns
- Verify the concern by operating the vehicle
- Check the transmission fluid level and condition
- Check for non-factory-installed items and verify correct installation
- Check the selector lever linkage adjustments
- Check TSBs for vehicle concerns
- Carry out the self-tests Key ON Engine OFF (KOEO) and Key ON Engine Running (KOER)
- Record all DTCs

**Diagnostic Flow Chart**

Test	Result	Action
1) Were any DTCs recorded?	Yes	<ul style="list-style-type: none"> <li>• REPAIR all DTCs. FOLLOW the pinpoint tests. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual first, then this workshop manual.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• REFER to <u>Diagnosis By Symptom</u> in this section, then GO to Step 5.</li> </ul>
2) Are any continuous test memory codes present?	Yes	<ul style="list-style-type: none"> <li>• CLEAR codes and CARRY OUT drive cycle test.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• GO to Step 4.</li> </ul>
3) Did the continuous test memory codes reappear?	Yes	<ul style="list-style-type: none"> <li>• REPAIR all continuous test memory codes. FOLLOW the pinpoint tests. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual then the transmission reference manual, then this workshop manual, then GO to Step 4.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• GO to Step 4.</li> </ul>
4) Is the concern repaired?	Yes	

		<ul style="list-style-type: none"> <li>• CARRY OUT the final self test to verify that no DTCs are present. CLEAR memory codes.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• REFER to <u>Diagnosis By Symptom</u> in this section.</li> </ul>
5) Are there any electrical concerns?	Yes	<ul style="list-style-type: none"> <li>• INSTALL the scan tool and CARRY OUT the output state control test, then GO to Step 6.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• REFER to the hydraulic and mechanical routine to diagnose and REPAIR the concern, then GO to Step 7.</li> </ul>
6) Was the transmission concern corrected when the scan tool was installed?	Yes	<ul style="list-style-type: none"> <li>• REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual, and use the scan tool to diagnose cause of concern in the processor, vehicle harness or external inputs (sensors or switches).</li> </ul>
	No	<ul style="list-style-type: none"> <li>• REFER to the hydraulic and mechanical routine to diagnose the concern, then GO to Step 7.</li> </ul>
7) Is the concern repaired?	Yes	<ul style="list-style-type: none"> <li>• CARRY OUT the final self test to verify that no DTCs are present. CLEAR memory codes.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• Concern should have been repaired. GO back through the diagnostic flow chart and REVIEW other components that may have contributed to the concern. CHECK and DIAGNOSE those components. Get assistance from other sources.</li> </ul>

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**Preliminary Inspection****Material**

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

The following items must be checked prior to beginning the diagnostic procedures:

**Know and Understand the Concern**

In order to correctly diagnose a concern, first understand the customer complaint or condition. Customer contact may be required in order to begin to verify the concern. Understand the conditions as to when the concern occurs, for example:

- Hot or cold vehicle temperature
- Hot or cold ambient temperature
- Vehicle driving conditions
- Vehicle loaded/unloaded

After understanding when and how the concern occurs, proceed to Verification of Condition.

**Verification of Condition**

This section provides information that must be used in both determining the actual cause of customer concerns and carrying out the appropriate procedures.

The following procedures must be used when verifying customer concerns for the transmission.

**Determine Customer Concern**

**NOTE:** Some transmission conditions can cause engine concerns. An Electronic Pressure Control (EPC) short circuit can cause engine misfiring. The Torque Converter Clutch (TCC) not disengaging will stall the engine.

Determine customer concerns relative to vehicle use and dependent driving conditions, paying attention to the following items:

- Hot or cold vehicle operating temperature
- Hot or cold ambient temperatures
- Type of terrain
- Vehicle loaded/unloaded

- City/highway driving
- Upshift
- Downshift
- Coasting
- Engagement
- Noise/vibration - check for dependencies, either rpm dependent, vehicle speed dependent, shift dependent, gear dependent, range dependent or temperature dependent

## Check Transmission Fluid Level and Condition

### Transmission Fluid Level Check

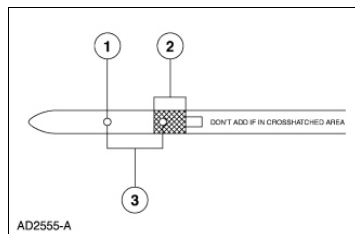
**NOTICE:** The vehicle should not be driven if the transmission fluid level indicator shows the transmission fluid below the DO NOT DRIVE mark or internal failure may result.

**NOTE:** If vehicle has been operated for an extended period of time at highway speeds, in city traffic, in hot weather or when pulling a trailer, the transmission fluid needs to cool down to obtain an accurate reading.

**NOTE:** The transmission fluid level reading on the transmission fluid level indicator will differ from operating and ambient temperatures. The correct reading should be within the normal operating temperature range.

Under normal circumstances, the transmission fluid level should be checked during normal maintenance. If the transmission starts to slip, shifts slowly or has signs of transmission fluid leaking, the transmission fluid level should be checked.

1. With the selector lever in PARK, the engine at idle, the brake pedal applied, move the selector lever through each gear and allow transmission engagement of each gear. Place the selector lever in the PARK position.
2. Wipe the transmission fluid level indicator cap and remove the transmission fluid level indicator.
3. Wipe the transmission fluid level indicator with a clean cloth.
4. Install the transmission fluid level indicator back in the transmission fluid filler tube until it is fully seated, then remove the transmission fluid level indicator. The transmission fluid level should be within the normal operating temperature range.



Item	Description
1	Do not drive if below mark
2	Transmission fluid level at operating temperature 66°C-77°C (150°F-170°F)
3	Transmission fluid level at room temperature 21°C-35°C (70°F-95°F)

### **High Transmission Fluid Level**

A transmission fluid level that is too high may cause the transmission fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming and possible transmission malfunction and/or damage. If an overfill reading is indicated, drain and refill the transmission.

### **Low Transmission Fluid Level**

A low transmission fluid level could result in poor transmission engagement, slipping, malfunction and/or damage. This could also indicate a leak in the transmission seals or gaskets.

### **Adding Transmission Fluid**

**NOTICE:** The use of any type of transmission fluid other than specified may result in transmission malfunction and/or damage.

If transmission fluid needs to be added, add transmission fluid in 0.25L (1/2 pt) increments through the transmission fluid filler tube. Do not overfill the transmission. For transmission fluid type, refer to the General Specifications chart.

### **Transmission Fluid Condition Check**

1. Check the transmission fluid level.
2. Observe the color and the odor. Under normal conditions the transmission fluid should be dark red, not brown or black in color or have a burnt odor.
3. Hold the transmission fluid level indicator over a white facial tissue and allow the transmission fluid to drip onto the facial tissue and examine the stain.
4. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.
5. If the stain is a foamy pink color, this may indicate coolant in the transmission. The engine cooling system should be inspected at this time.
6. If transmission fluid contamination or transmission failure is confirmed by the sediment in the bottom of the transmission fluid pan, the transmission must be disassembled and completely cleaned. This includes the torque converter, coolers and cooler tubes.
7. Carry out diagnostic checks and adjustments; refer to Diagnosis By Symptom in this section.

### **Water in Transmission Fluid**

To correctly repair an automatic transmission or transaxle that has had water or coolant introduced into the system, completely disassemble, clean and replace the following parts:

- All internal and external seals
- All friction material; clutches and bands
- Torque converter
- All parts with bonded seals
- All solenoids
- All transmission fluid filters

Prior to installing the transmission or transaxle, the transmission fluid cooler(s), transmission fluid cooler tubes and transmission fluid cooler hoses need to be flushed and cleaned.

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**Shift Point Road Test**

**NOTE:** Always drive the vehicle in a safe manner according to the driving conditions and obey all traffic laws.

The Shift Point Road Test provides diagnostic information on transmission shift controls.

This test verifies that the shift control system is operating correctly.

1. Bring the engine and transmission up to normal operating temperature.
2. Operate vehicle with the selector lever in the (D) position.
3. Apply minimum throttle and observe vehicle speeds at which an upshift occurs and the torque converter engages; refer to the Shift Speed Chart in this section.
4. With the transmission in (D) (4th gear), press the Transmission Control Switch (TCS). The transmission should downshift to 3rd gear. Release the accelerator pedal; engine braking should occur.
5. Press accelerator pedal to floor, Wide Open Throttle (WOT). Transmission should shift from 3rd to 2nd gear, or 3rd to 1st, depending on vehicle speed. Torque Converter Clutch (TCC) should disengage and then reapply.
6. With the selector lever in the (D) position and vehicle speed above 80 km/h (50 mph) and less than half throttle, move the selector lever from the (D) position to the manual 2 position and remove pressure from the accelerator pedal. Transmission should immediately downshift into 2nd gear. With selector lever remaining in manual 2 position, move the selector lever into the manual 1 position and release accelerator pedal. Transmission should downshift into 1st gear at speeds approximately below 45-56 km/h (28-35 mph).
7. If transmission fails to upshift/downshift or TCC does not apply and release, refer to Diagnosis By Symptom in this section.

**Shift Speed Chart**

**NOTE:** Shift speed ranges are approximate for all applications. For specific applications (engine, axle ratio and application), refer to the Automatic Transmission Specification booklet. Do not exceed local speed laws.

Throttle Position	Shift	km/h	mph
Closed Throttle	4-3	23-61	14-38
	3-2	18-34	11-21
	2-1	10-19	6-12
Light Throttle	1-2	13-35	8-22
Throttle Position (TP) Voltage	2-3	23-58	14-36
1.25 Volts	3-4	45-87	28-54



## 2010 Crown Victoria, Grand Marquis Workshop Manual


Wide Open Throttle	1-2	60-87	37-54
	2-3	117-150	73-93
	3-2	108-135	67-84
	2-1	47-58	29-36

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## Torque Converter Diagnosis

### Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTE:** Always drive the vehicle in a safe manner according to the driving conditions and obey all traffic laws.

The Torque Converter Operation Test provide diagnostic information on the transmission torque converter operation.

Prior to new torque converter installation, all diagnostic procedures must be followed. This is to prevent the unnecessary installation of new or remanufactured torque converters. Only after a complete diagnostic evaluation can the decision be made to install a new torque converter.

Begin with the normal diagnostic procedures as follows:

1. Preliminary inspection.
2. Know and understand the customer concern.
3. Verify the condition â carry out the Torque Converter Operation Test.
4. Carry out diagnostic procedures.
  - Carry out On-Board Diagnostic (OBD); refer to Diagnostics in this section.
    - ◆ Repair all non-transmission related DTCs first.
    - ◆ Repair all transmission DTCs.
    - ◆ Rerun OBD to verify repair.
  - Carry out Line Pressure Test. Refer to Special Testing Procedures in this section.
  - Carry out Stall Speed Test. Refer to Special Testing Procedures in this section.
  - Carry out Diagnostic Routines. Refer to Diagnosis By Symptom in this section.
    - ◆ Use the Diagnosis by Symptom Chart to locate the appropriate routine that best describes the symptom(s). The routine will list all possible components that may cause or contribute to the symptom. Check each component listed; diagnose and repair as required before changing the torque converter.

### Torque Converter Operation Test

This test verifies that the Torque Converter Clutch (TCC) control system and the torque converter are operating correctly.

## 2010 Crown Victoria, Grand Marquis Workshop Manual

1. Carry out Self Test with scan tool. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Check for DTCs.
2. Connect the scan tool.
3. Bring the engine to normal operating temperature by driving the vehicle at highway speeds in the (D) position.
4. After normal operating temperature is reached, maintain a constant vehicle speed of about 80 km/h (50 mph) and tap the brake pedal with the left foot.
5. Engine rpm should increase when the brake pedal is tapped, and decrease about 5 seconds after the pedal is released. If this does not occur, see torque converter operation concerns. Refer to Diagnosis By Symptom in this section.
6. If the vehicle stalls in (D) or manual 2 at idle with vehicle at a stop, move the transmission selector lever to the manual 1 position. If the vehicle stalls, see torque converter operation concerns. Refer to Diagnosis By Symptom in this section. If the vehicle does not stall in (D), refer to Diagnosis By Symptom in this section.
7. If the vehicle exhibits a vibration during the road test complete the Torque Converter Road Evaluation Form. This form will aid the technician in determining the source of the vibration.

**NOTE:** The following is a list of common vehicle concerns that have been misdiagnosed as TCC shudder. For diagnosis of the following items, refer to the appropriate sections of the workshop manual and the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

- Spark plugs â check for cracks, high resistance or broken insulators.
- Ignition coil-on-plug â short or open circuit.
- Fuel injector â filter may be plugged.
- Fuel contamination â engine runs poor.
- EGR valve â valve may let in too much exhaust gas and cause engine to run lean.
- Vacuum leak â engine will not get correct air/fuel mixture.
- Manifold Absolute Pressure (MAP)/Mass Air Flow (MAF) sensor â improper air/fuel mixture.
- Heated Oxygen Sensor (HO2S) â too rich/lean air/fuel mixture.
- Fuel pressure â may be too low.
- Engine mounts â loose/damaged mounts can cause vibration concerns.
- Axle joints â check for vibration.

Torque Converter Road Evaluation Form		
1)â Does the torque converter engage/disengage?	Yes	<ul style="list-style-type: none"> <li>• GO to Step 2.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• REFER to <u>Diagnosis By Symptom</u> â Torque Converter No Apply Routine 240/340 and Always Applied Routine 241/341 found in this section for further diagnosis information. REPAIR as required, VERIFY converter operation and then continue.</li> </ul>

2)â Does vibration occur during 3-4 or 4-3 shift at: light, medium or heavy throttle?	Light	<ul style="list-style-type: none"> <li>• May be Torque Converter Clutch (TCC) shudder, GO to Step 3.</li> </ul>
	Medium	<ul style="list-style-type: none"> <li>• May be TCC shudder, GO to Step 3.</li> </ul>
	Heavy	<ul style="list-style-type: none"> <li>• Not TCC shudder â converter does not engage due to PCM strategy, REFER to <u>Section 100-04</u> and <u>Diagnosis By Symptom</u> â Noise/Vibration Routine 254/354 found in this section for further diagnosis.</li> </ul>
3)â Is the problem vehicle speed dependent, operating at steady speed, i.e., 64 km/h (40 mph) regardless of transmission range? Verify by manually selecting 2nd, Overdrive (O/D) cancel, and O/D .	Yes	<ul style="list-style-type: none"> <li>• Not TCC shudder, REFER to <u>Section 100-04</u> and the <u>Diagnosis By Symptom</u> â Noise/Vibration Routine 254/354 found in this section for further diagnosis.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• GO to Step 4.</li> </ul>
4)â Is the problem engine-rpm dependent (occurs at the same engine rpm independent of transmission gear)? Verify by holding same rpm in each transmission gear.	Yes	<ul style="list-style-type: none"> <li>• Not TCC shudder, REFER to <u>Section 100-04</u> and the <u>Diagnosis By Symptom</u> â Noise/Vibration Routine 254/354 found in this section for further diagnosis.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• GO to Step 5.</li> </ul>
5)â Does the problem occur in coast, steady speed or reverse range?	Yes	<ul style="list-style-type: none"> <li>• Not TCC shudder, REFER to <u>Section 100-04</u> and the <u>Diagnosis By Symptom</u> â Noise/Vibration Routine 254/354 found in this section for further diagnosis.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• GO to Step 6.</li> </ul>
6)â Does vibration occur during extended light brake application?	Yes	<ul style="list-style-type: none"> <li>• Not TCC shudder, REFER to <u>Section 100-04</u> , <u>Section 206-00</u> and the <u>Diagnosis By Symptom</u> â Noise/Vibration Routine 254/354 found in this section for further diagnosis.</li> </ul>
	No	<ul style="list-style-type: none"> <li>• GO to Step 7.</li> </ul>
7)â If one of the driving modes in Step 2 identifies a vibration which is not present in Steps 3-6, then there is a strong possibility that the vibration is caused by the TCC function. Carry out the repair procedures as found under Disassembly/Assembly.		



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## Visual Inspection

**⚠ WARNING: If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

This inspection will identify modifications or additions to the vehicle operating system that may affect diagnosis. Inspect the vehicle for non-Ford factory add-on devices such as:

- Electronic add-on items:
  - ◆ A/C
  - ◆ generator (alternator)
  - ◆ engine turbo
  - ◆ cellular telephone
  - ◆ cruise control
  - ◆ CB radio
  - ◆ linear booster
  - ◆ backup alarm signal
  - ◆ computer
- Vehicle modification:

These items, if not installed correctly, will affect the PCM, or transmission function. Pay particular attention to add-on wiring splices in the PCM harness or transmission wiring harness, abnormal tire size or axle ratio changes.

- Leaks; refer to Leakage Inspection in this section.
- Correct selector lever cable adjustments; refer to Section 307-05 for Selector Lever Cable Adjustment.

## Selector Lever Linkage Check

Check for a misadjustment in the selector lever cable by matching the detents in the transmission selector lever with those of the manual lever in the transmission. If they match, the misadjustment is in the indicator. Do not adjust the selector lever cable.

Hydraulic leakage at the manual control valve can cause delay in engagements and/or slipping while operating if the selector lever cable is not correctly adjusted. Refer to Section 307-05 for Selector Lever Cable Adjustment.

## Check TSBs

Refer to all TSBs which pertain to the transmission concern and follow the procedure as described.

## Carry Out On-Board Diagnostic (OBD) Key ON Engine OFF (KOEO), Key ON Engine Running (KOER)


After a road test, with the vehicle warm and before disconnecting any connectors, carry out the Self Test using the diagnostic tool. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.



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**Diagnostics**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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Diagnosing an electronically controlled automatic transmission is simplified by using the following procedures. One of the most important things to remember is that there is a definite procedure to follow. **DO NOT TAKE SHORT CUTS OR ASSUME THAT CRITICAL CHECKS OR ADJUSTMENTS HAVE ALREADY BEEN MADE.** Follow the procedures as written to avoid missing critical components or steps. By following the diagnostic sequence, the technician will be able to diagnose and repair the concern the first time.

**On-Board Diagnostic (OBD) With Scan Tool**

**NOTE:** For detailed instruction and other diagnostic methods using the scan tool, refer to the scan tool tester manual and the Powertrain Control/Emissions Diagnosis (PC/ED) manual. These self-tests should be used to diagnose the PCM and should be carried out in order.

- Visual Inspection
- Set Up Self Test
- Key ON Engine OFF (KOEO)
- All Continuous Memory DTCs
- Key ON Engine Running (KOER)
  - ◆ Wiggle Test
  - ◆ Network Test
  - ◆ Reset Keep Alive Memory (KAM)
  - ◆ Clearing DTCs
  - ◆ OBD Drive Cycle
- Other Scan Tool Features

For further information on other diagnostic testing features using the scan tool, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Other diagnostic methods include the following:


- ◆ PID Access Mode
  - ◆ Freeze Frame Data Access Mode
  - ◆ Oxygen Sensor Monitor Mode
-





**Diagnostic Parameters Identification (PID) Chart**

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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PID Name	PID Description	Units
ACCS	Air Conditioning Compressor Cycling Switch	On/Off
APP	Accelerator Pedal Position (APP)	%
APP1	APP 1	Volts 4.07
APP2	APP 2	Volts 1.43
APP3	APP 3	Volts .92
AXLE	Axle Ratio	Ratio
BARO	Barometric Pressure (BARO)	Frequency
BARO	BARO	Pressure
BARO	BARO	Vacuum
BPA	Brake Pedal Applied	On/Off
BPP/BOO	BPP /Brake On Off	On/Off
CHT	Cylinder Head Temperature (CHT)	Degrees -4 to 248
CPP/PNP	Clutch Pedal Position (CPP)/Park Neutral Position	Park/Neutral
DPFEGR	Delta Feedback Pressure Exhaust Gas Recirculation (EGR)	Volts 0-5
DTCCNT	Diagnostic Trouble Code Count	Number
EGRVR#	EGR Valve Duty Cycle	0-100%
EGRVR_F	EGR Vacuum Regulator Fault	Fault/No Fault
ETC_ACT	Electronic Throttle Control (ETC) Actual	Angle 0-100%
ETC_DSD	ETC Desired	Angle 0-100%
FAN_CTRL#	Fan Control (FC)	Mode
FP#	Fuel Pump (FP)	Mode On/Off
FP#	FP	%
FP_F	FP Fault	Fault/No Fault
FRP	Fuel Rail Pressure (FRP)	Pressure
FRP	FRP	Volts
FUELSYS	Fuel System Loop Status	Open/Closed
GEAR#	Gear Commanded by Module	1, 2, 3, 4, 5
GEAR_MAX	Highest Gear Available for Vehicle Speed	1, 2, 3, 4, 5

## 2010 Crown Victoria, Grand Marquis Workshop Manual

GEAR_OSC	Gear Commanded by Output State Control	1, 2, 3, 4, 5
GEAR_RAT	Gear Ratio	Ratio 0-5:1
IAT	Intake Air Temperature (IAT)	Temp
IAT	IAT	Volts
LINEDSD#	Line Pressure Control (LPC) Desired	Pressure
LOAD	Engine Load	%
LONGFT1	Long Term Fuel Trim 1	%
LONGFT2	Long Term Fuel Trim 2	%
MAF	Mass Air Flow (MAF)	Flow
MAF	MAF	Volts
MAP	Manifold Absolute Pressure (MAP)	Volts
MAP_GAUGE	Manifold Pressure Displayed in Vacuum Gauge Format	0-30 Hz
MISFIRE	Engine Misfire	Counts
O2S11	Oxygen Sensor Bank 1 Sensor 1	Mode
O2S11	Oxygen Sensor Bank 1 Sensor 1	millivolts
O2S12	Oxygen Sensor Bank 2 Sensor 2	millivolts
O2S21	Oxygen Sensor Bank 2 Sensor 1	Mode
O2S21	Oxygen Sensor Bank 2 Sensor 1	millivolts
O2S22	Oxygen Sensor Bank 2 Sensor 2	millivolts
OD_CANCL	Overdrive (O/D) Cancel	Mode
OSSFMM	Output Shaft Speed (OSS) Failure Mode	Fault/No Fault
OSS_F	OSS Fault	Fault/No Fault
OSS_SRC	Unfiltered OSS	rpm
PCA	Pressure Control Solenoid A (PCA)	Pressure
PCA AMP	PCA Amp	Current
PCA_F	PCA Fault	Fault/No Fault
PCFM	PCA Failure Mode	Fault/No Fault
PVT	Pressure Vacuum Transducer	Pressure
PVT	Pressure Vacuum Transducer	Vacuum
RPM#	Revolutions Per Minute	rpm
SCCS	Speed Control Command Switch	Mode
SCCS	Speed Control Command Switch	Volts
SHFT_DROP	Shift rpm Drop in Input Shaft Speed Below Expected	rpm
SHFT_FLRE	Shift rpm Rise in Input Shaft Speed Above Expected	rpm
SHFT_ID	Shift Identification of Shift PIDs Lag, Time, Flair and Drop	Number
SHFT_LAG	Shift Time Elapsed from 10% to 90% of Complete	Time
SHFT_TIME	Shift Time Elapsed Commanded to 10% of Complete	Time
SHRTFT1	Short Term Fuel Trim 1	%
SHRTFT2	Short Term Fuel Trim 2	%
SSA/SS1#	Shift Solenoid A (SSA)/1	Mode
SSA/SS1_F	SSA /1 Fault	Fault/No Fault
SSB/SS2#	Shift Solenoid B (SSB)/2	Mode
SSB/SS2_F	SSB /2 Fault	Fault/No Fault
TCC#	Torque Converter Clutch (TCC) Solenoid Commanded State	Mode

TCC#	TCC Solenoid Commanded State	Percentage
TCCFM	TCC Unlocking due to Slippage	Fault/No Fault
TCCPC	TCC Pressure Control	Pressure
TCC_F	TCC Fault	Fault/No Fault
TCC_OSC#	TCC Output State Control	Mode
TCC_OT	Transmission Over-Temperature	Fault/No Fault
TCC_RAT	Transmission Slip Ratio	Ratio
TCS	Transmission Control Switch (TCS)	Mode
TC_SLIPACT	Torque Converter Slip Actual	rpm
TC_SLIPDSD	Torque Converter Slip Desired	rpm
TC_SLIP_ABSL	Absolute Value of Slip	rpm
TFT	Transmission Fluid Temperature (TFT)	Temp
TFT	TFT	Volts
TFT_F	TFT Fault	Fault/No Fault
TIRESIZE	Tire Size Rev/Mile	rpm
TP1	Throttle Position (TP) Sensor 1	Volts
TP2	TP Sensor 2	Volts
TQ_CNTRL	Torque Control	Nm -150/500
TR	Transmission Range (TR) Sensor	Mode
TR1	TR Sensor 1	Mode
TR2	TR Sensor 2	Mode
TR3	TR Sensor 3	Mode
TR3_V	TR Sensor 3 Volts	Volts
TR4	TR Sensor 4	Mode
TRAC_ACT	Traction Control Actual	Mode
TRAC_IND	Traction Control Indicated	Mode
TRAN_OT	Transmission Overtemp	Fault/No Fault
TRAN_RAT	Transmission Gear Ratio	Ratio
TRIP CNT	Number of On-Board Diagnostic (OBD) Trips Complete	Number
TR_F	TR Status Fault	Fault/No Fault
TSS	Turbine Shaft Speed (TSS)	rpm
TSSFM	TSS Failure Mode	Fault/No Fault
TSS_F	TSS Fault	Fault/No Fault
TSS_SRC	Unfiltered TSS Sensor	rpm
VPWR	Module Supply Voltage	Volts
VREF	Module Reference Voltage	Volts
VSS	Vehicle Speed Sensor (VSS)	mph 0-80
VSS_F	VSS Fault	Fault/No Fault
VSS_FM	VSS Signal Status	Fault/No Fault
WAC/ACCR	Air Conditioning Clutch	On/Off



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## Transmission Drive Cycle Test

**NOTE:** Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

**NOTE:** The Transmission Drive Cycle Test must be followed exactly. Malfunctions must occur 4 times consecutively for a shift error DTC to set, and 5 times consecutively for continuous Torque Converter Clutch (TCC) code to set.

**NOTE:** When carrying out the Transmission Drive Cycle Test, refer to the Solenoid Application Chart for correct solenoid operation.

After carrying out the Self Test, use the Transmission Drive Cycle Test for checking continuous codes.

1. Record and then clear Self Test DTCs.
2. Warm engine to normal operating temperature.
3. Make sure transmission fluid level is correct.
4. With the selector lever in (D), moderately accelerate from stop to 80 km/h (50 mph). This allows the transmission to shift into 4th gear. Hold speed and throttle open steady for a minimum of 15 seconds.
5. With the transmission in 4th gear and maintaining steady speed and throttle opening, lightly apply and release the brake pedal to operate the stoplamps. Then hold speed and throttle steady for a minimum of 5 seconds.
6. Brake to a stop and remain stopped for a minimum of 20 seconds.
7. Repeat Steps 4 through 6 at least 5 times.
8. Carry out Self Test and record continuous DTCs.
  - If the DTCs are still present, refer to the DTC Chart. Repair all non-transmission DTCs first as they can directly affect the operation of the transmission. Repeat the Self Test and the Road Test to verify the correction. Clear the DTCs, carry out the Drive Cycle Test and repeat the Self Test after completing repair on the DTC.
  - If the continuous test passes and a concern is still present, refer to Diagnosis By Symptom in this section and TSBs for concerns.

## After On-Board Diagnostic (OBD)

**NOTE:** The vehicle wiring harness, PCM and non-transmission sensors may affect transmission operations. Repair these concerns first.

After the On-Board Diagnostic (OBD) tests are completed, repair all DTCs.

Begin with non-transmission related DTCs, then repair any transmission related DTCs. Use the DTC Chart for information on condition and symptoms. This chart will be helpful in referring to the correct manual(s) and aids in diagnosing internal transmission concerns and external non-transmission inputs. The pinpoint tests are used in diagnosing transmission electrical concerns. Make sure that the vehicle wiring harness and the PCM

are diagnosed as well. The Powertrain Control/Emissions Diagnosis (PC/ED) manual will aid in diagnosing non-transmission electronic components.

### Before Pinpoint Tests

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTE:** Prior to entering pinpoint tests, check the PCM wiring harness connectors and in-line connectors for tight connections, bent or broken terminals, corrosion, loose wires, correct routing, correct seals and their condition. Check the PCM, sensors and actuators for damage. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

**NOTE:** If a concern still exists after electrical diagnosis has been carried out, refer to Diagnosis By Symptom in this section.

If DTCs appear while carrying out the OBD test, refer to the Diagnostic Trouble Code (DTC) Charts for the appropriate repair procedure. Prior to entering pinpoint tests, refer to any TSBs for transmission concerns.

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**Diagnostic Trouble Code (DTC) Charts****DTC Chart**

<b>DTC</b>	<b>Component</b>	<b>Description</b>	<b>Condition</b>	<b>Symptom</b>	<b>Action</b>
P0102 P0103 P1100 P1101	Mass Air Flow (MAF)	MAF concerns	MAF system has a malfunction which may cause a transmission concern.	High or low Electronic Pressure Control (EPC) pressure, incorrect shift schedule. Incorrect Torque Converter Clutch (TCC) engagement scheduling. Symptoms similar to a Throttle Position (TP) failure.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0112	Intake Air Temperature (IAT)	IAT indicates 125°C (257°F) (grounded)	Voltage drop across IAT exceeds scale set for temperature 125°C (257°F).	Incorrect EPC pressure, either high or low, results in harsh or soft shifts.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0113	IAT	IAT indicates -40°C (-40°F) (open circuit)	Voltage drop across IAT exceeds scale set for temperature -40°C (-40°F).	Incorrect EPC pressure, either high or low, results in harsh or soft shifts.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0114	IAT	IAT out of On-Board Diagnostic (OBD) range	IAT temperature higher or lower than expected during Key ON Engine OFF (KOEO) and Key ON Engine Running (KOER).	Rerun OBD test at normal operating temperature.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0117	Engine Coolant Temperature (ECT)	ECT indicates 125°C (257°F)	Voltage drop across ECT exceeds scale set for temperature 125°C (257°F) (grounded).	TCC will always be off, resulting in reduced fuel economy.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0118	ECT	ECT indicates -40°C (-40°F)	Voltage drop across ECT exceeds scale set for temperature -40°C (-40°F) (open circuit).	TCC will always be off, resulting in reduced fuel economy.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
	TP	TP concern			



P0122			PCM has detected an error that may cause a transmission concern.	Harsh engagements, firm shift feel, abnormal shift schedule, TCC does not engage, TCC cycling.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0123					
P1120					
P0300- P0308 P0320 P0340 P1351- P1364	Electronic Ignition (EI)	EI system concerns	EI system has a malfunction which may cause a transmission concern.	Harsh engagements and shifts, late Wide Open Throttle (WOT) shifts, no TCC engagement.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0500 P0503 P1502	ABS	Insufficient Vehicle Speed Sensor (VSS) input from ABS through Standard Corporate Protocol (SCP) link	PCM detected a loss of VSS signal through SCP link from ABS.	No transmission symptom; Instrument Cluster (IC) speedometer may be affected.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. *
P0705	Transmission Range (TR)	TR circuit failure	TR circuits, indicating an invalid pattern in TR_D. Condition caused by a short to ground or an open in TR 4, TR 3, TR 2 and/or TR 1 circuits. This DTC cannot be set by an incorrectly adjusted TR sensor.	Increase in EPC pressure (harsh shifts). Defaults to (D) or D for all gear positions. In (D) position trans, stuck in D or manual 2.	<u>GO to Pinpoint Test C .</u>
P0708	TR	TR sensor circuit TR 3 open	TR sensor circuit TR 3 reading 2.6 V- 5.0 V (open circuit). This DTC cannot be set by an incorrectly adjusted TR sensor.	Increase in EPC pressure. Defaults to (D) or D for all gear ranges.	<u>GO to Pinpoint Test C .</u>
P0712	Transmission Fluid Temperature (TFT), wiring, PCM	157°C (315°F) indicated TFT sensor circuit grounded	Voltage drop across TFT sensor exceeds scale set for temperature of 157°C (315°F).	Firm shift feel.	<u>GO to Pinpoint Test B .</u>
P0713	TFT , wiring, PCM	-40°C (-40°F) indicated TFT	Voltage drop across TFT sensor	Firm shift feel.	<u>GO to Pinpoint Test B .</u>

## 2010 Crown Victoria, Grand Marquis Workshop Manual

		sensor circuit open	exceeds scale set for temperature -40°C (-40°F).		
P0715	Turbine Shaft Speed (TSS)	Insufficient input from TSS sensor	PCM detected a loss of TSS signal during operation.	Harsh shifts, harsh TCC activation and harsh engagements.	<u>GO to Pinpoint Test F</u> .
P0717	TSS	TSS sensor signal intermittent	PCM has detected an intermittent TSS signal.	Harsh shifts, harsh TCC activation and harsh engagements.	<u>GO to Pinpoint Test F</u> .
P0718	TSS	TSS sensor signal noisy	PCM has detected a noisy TSS signal.	Harsh shifts, harsh TCC activation and harsh engagements.	<u>GO to Pinpoint Test F</u> .
P0720	Output Shaft Speed (OSS)	Insufficient input from OSS sensor	PCM detected a loss of OSS signal during operation.	Harsh shifts, abnormal shift schedule, no TCC activation.	<u>GO to Pinpoint Test E</u> .
P0721	OSS	OSS sensor signal noisy	PCM has detected an erratic OSS signal.	Harsh shifts, abnormal shift schedule, no TCC engagement.	<u>GO to Pinpoint Test E</u> .
P0722	OSS wiring	Insufficient input from OSS	PCM has detected a loss of OSS signal.	Harsh shifts, abnormal shift schedule, no TCC engagement.	<u>GO to Pinpoint Test E</u> .
P0731	Shift Solenoid A (SSA), Shift Solenoid B (SSB) or internal parts	1st gear error	No 1st gear.	Incorrect gear selection, depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	Use the Solenoid Operation Chart, refer to <u>Pinpoint Tests - OSC Equipped Vehicle</u> in this section. <u>GO to Pinpoint Test A</u> .
P0732	SSA , SSB or internal parts	2nd gear error	No 2nd gear.	Incorrect gear selection, depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	Use the Solenoid Operation Chart, refer to <u>Pinpoint Tests - OSC Equipped Vehicle</u> in this section. <u>GO to Pinpoint Test A</u> .
P0733	SSA , SSB or internal parts	3rd gear error	No 3rd gear.	Incorrect gear selection, depending	Use the Solenoid Operation Chart, refer

				on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	to <u>Pinpoint Tests - OSC Equipped Vehicle</u> in this section. <u>GO to Pinpoint Test A</u> .
P0734	SSA , SSB , or internal parts	4th gear error	No 4th gear.	Incorrect gear selection, depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material). Engine rpm could be higher or lower than expected.	Use the Solenoid Operation Chart, refer to <u>Pinpoint Tests - OSC Equipped Vehicle</u> in this section. <u>GO to Pinpoint Test A</u> .
P0740	TCC , wiring, PCM	TCC electrical failure	TCC circuit fails to provide voltage drop across solenoid. Circuit open, shorted or PCM driver failure during on-board diagnostics.	Short circuit, engine stalls in 2nd ((D), manual 2 range) at low speeds with brake pedal applied. Open circuit, TCC never engages. May flash Transmission Control Indicator Lamp (TCIL).	<u>GO to Pinpoint Test A</u> .
P0741 **	TCC , internal components	TCC slippage detected	The PCM picked up an excessive amount of slippage during normal vehicle operation.	TCC slippage/erratic or no TCC operation. Flashing TCIL .	Refer to <u>Diagnosis By Symptom</u> in this section.
P0743 *	TCC , wiring, PCM	TCC solenoid circuit failure during OBD test.	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM driver failure during OBD test.	Short circuit: engine stalls in second ((D), 2 range) at low idle speeds with brake pedal applied.  Open circuit: TCC never engages. May flash TCIL .	<u>GO to Pinpoint Test A</u> .
P0748 **	EPC solenoid	EPC solenoid circuit failure	Voltage through EPC solenoid is checked. An error will be noted if	Short circuit results in minimum EPC pressure (minimum capacity) and limits	<u>GO to Pinpoint Test D</u> .

			tolerance is exceeded.	engine torque (alternate firm). Not all gears present. Open circuit: maximum Pressure Control Solenoid A (PCA) pressure, harsh engagements and shifts.	
P0750 *	SSA , wiring, PCM	SSA solenoid circuit failure	SSA circuit failed to provide voltage drop across the solenoid. Circuit open or shorted or PCM driver failure during OBD test.	Incorrect gear selection depending on condition mode and manual lever position. See Solenoid On/Off Chart.	<u>GO to Pinpoint Test A .</u>
P0753	SSA , wiring, PCM	SSA electrical failure	SSA circuit fails to provide voltage drop across the solenoid. Circuit open or shorted or PCM driver failure during OBD test.	Incorrect gear depending on condition mode and manual lever position. See Solenoid On/Off Chart. May flash TCIL .	<u>GO to Pinpoint Test A .</u>
P0755 *	SSB , wiring, PCM	SSB solenoid circuit failure	SSB circuit fails to provide voltage drop across the solenoid. Circuit open or shorted or PCM driver failure during OBD test.	Incorrect gear selection depending on condition mode and manual lever position. See Solenoid On/Off Chart.	<u>GO to Pinpoint Test A .</u>
P0758 *	SSB , wiring, PCM	SSB electrical circuit failure	SSB circuit fails to provide voltage drop across the solenoid. Circuit open or shorted or PCM driver failure during OBD test.	Incorrect gear depending on condition mode and manual lever position. See Solenoid On/Off Chart. May flash TCIL .	<u>GO to Pinpoint Test A .</u>
P0781 **	SSA or internal parts	1-2 shift error	Engine rpm drop not detected when 1-2 shift was commanded by PCM.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material).	Refer to Solenoid Operation Chart, then <u>GO to Pinpoint Test A .</u>
		2-3 shift error			

## 2010 Crown Victoria, Grand Marquis Workshop Manual

P0782 **	SSA , SSB or internal parts		Engine rpm drop not detected when 2-3 shift was commanded by PCM.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material).	Refer to Solenoid Operation Chart, then <u>GO to Pinpoint Test A</u> .
P0783 **	SSA , SSB or internal parts	3-4 shift error	Engine rpm drop not detected when 3-4 shift was commanded by PCM.	Incorrect gear selection depending on failure or mode and manual lever position. Shift errors may also be due to other internal transmission concerns (stuck valves, damaged friction material).	Refer to Solenoid Operation Chart, then <u>GO to Pinpoint Test A</u> .
P0963	EPC solenoid	EPC solenoid short to power, circuit failure	Voltage through EPC solenoid is checked. An error will be noted if parameters are exceeded.	Maximum EPC pressure, harsh engagements and shifts.	<u>GO to Pinpoint Test D</u> .
P1116	ECT	ECT out of OBD range	ECT temperature higher or lower than expected during KOEO and KOER .	Rerun OBD test at normal operating temperature.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1124	TP	TP voltage high/low for OBD test	TP was not in the correct position for OBD test.	Rerun OBD per application.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1460	A/C	A/C clutch cycling pressure switch error	A/C or defrost on condition may result from A/C clutch being on during OBD test.	DTC set during OBD test, repeat with A/C off. Failed on, EPC pressure slightly low with A/C off.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1636	PCM	PCM detected internal error	-	-	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1702	TR	Intermittent DTC P0705 or P0708	Refer to DTC P0705 or P0708.	Refer to DTC P0705 or P0708.	<u>GO to Pinpoint Test C</u> .
P1703	Brake Pedal Position (BPP)	BPP switch circuit failed	Brake ON/OFF circuit failure.	Failed on or not connected - TCC will	Refer to the Powertrain

## 2010 Crown Victoria, Grand Marquis Workshop Manual

				not engage at less than 1/3 throttle. Failed off or not connected - TCC will not disengage when brake is applied.	Control/Emissions Diagnosis (PC/ED) manual.
P1703	BPP	Brake not actuated during OBD test	Brake not cycled during KOER .	Failed off or not connected - TCC will not engage at less than 1/3 throttle. Failed off or not connected - TCC will not disengage when brake is applied.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1704	TR	TR circuit reading in between gear position during KOEO / KOER	TR sensor or selector lever cable incorrectly adjusted; or TR circuit failure.	Wrong commanded EPC pressure. TR reading the wrong gear position.	<u>GO to Pinpoint Test C .</u>
P1705	TR	TR self test was not carried out in PARK or NEUTRAL	Vehicle not in PARK or NEUTRAL during OBD test.	Rerun OBD test in PARK or NEUTRAL.	<u>GO to Pinpoint Test C .</u>
P1711	TFT	TFT out of OBD range	Transmission not at operating temperature during OBD test.	Warm vehicle to normal operating temperature.	<u>GO to Pinpoint Test B .</u>
P1713	TFT wiring PCM	TFT continually reading cold	TFT sensor in range low failure.	Firm shift feel. Substitute ECT for TFT .	<u>GO to Pinpoint Test B .</u>
P1714	SSA , internal components	SSA malfunction	Mechanical failure of the solenoid detected.	Incorrect gear selection depending on condition, mode and manual lever position. See Solenoid Operation Chart.	<u>GO to Pinpoint Test G .</u>
P1715	SSB	SSB malfunction	Mechanical failure of the solenoid detected.	Incorrect gear selection depending on condition, mode and manual lever position. See Solenoid Operation Chart.	<u>GO to Pinpoint Test G .</u>
P1718	TFT , wiring, PCM	TFT continually reading hot	TFT sensor in range high failure.	Firm shift feel. Substitute ECT for TFT .	<u>GO to Pinpoint Test B .</u>
P1728	Transmission	Transmission slip error	The PCM has detected an excessive amount of slippage during normal operation.	Transmission slippage erratic or no TCC operation.	Refer to <u>Diagnosis By Symptom</u> in this section.
P1740	TCC	TCC malfunction	Mechanical failure of the solenoid	Failed on - engine stalls in 2nd ((D),	<u>GO to Pinpoint Test G .</u>

## 2010 Crown Victoria, Grand Marquis Workshop Manual

			detected.	Manual 2 ranges) at low idle speeds with brake applied. Failed off - torque converter never applies.	
P1741 **	TCC , internal components	Excessive TCC engagement error	Excessive variations in slip (engine speed surge) across the TCC .	Engine rpm oscillation is present in 3rd gear.	<u>GO to Pinpoint Test A .</u>
P1742	TCC , internal components	TCC solenoid failed on	TCC solenoid has failed on by electric, mechanical or hydraulic concern.	Harsh shifts.	<u>GO to Pinpoint Test A .</u>
P1743	TCC , internal components	TCC solenoid failed on	TCC solenoid has failed on by electric, mechanical or hydraulic concern.	Harsh shifts.	<u>GO to Pinpoint Test A .</u>
P1744	TCC	TCC	The PCM picked up an excessive amount of TCC slippage during normal vehicle operation.	TCC slippage/erratic or no TCC operation.	Refer to <u>Diagnosis By Symptom</u> in this section.
P1746 * P0960	EPC , wiring, PCM	EPC solenoid open circuit	Voltage through EPC solenoid is checked. An error will be noted if tolerance is exceeded.	Open circuit causes maximum EPC pressure, harsh engagements and shifts.	<u>GO to Pinpoint Test D .</u>
P1747 * P0962	EPC , wiring, PCM	EPC solenoid circuit failure, shorted circuit or output driver	Voltage through EPC solenoid is checked. An error will be noted if parameters are exceeded.	Short circuit causes minimum EPC pressure (minimum capacity) and limits engine torque (alternate firm).	<u>GO to Pinpoint Test D .</u>
P1760	EPC , wiring, PCM	EPC solenoid circuit failure, shorted circuit or output driver	PCM detected a loss of EPC during operation.	Unexpected reduction in engine torque.	<u>GO to Pinpoint Test D .</u>
P1780	Transmission Control Switch (TCS)	TCS not changing states	TCS not cycled during self test. TCS circuit open or shorted.	Rerun OBD test and cycle switch. No (D) cancel when switch is cycled.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P1783	TFT	Transmission over temperature condition indicated	TFT exceeded 135°C (275°F).	-	<u>GO to Pinpoint Test B .</u>
U1039	PCM			No VSS input to IC .	

		Data communication link error	Insufficient VSS input to IC via SCP link.		Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. *
-	TCIL	TCIL circuit failure	TCIL circuit open or shorted.	Failed on, overdrive (D) cancel mode on. No flashing TCIL for EPC failure or sensor. Failed off, (D) cancel mode never indicated. No flashing TCIL for EPC sensor failure.	Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

\* Output circuit check, generated only by electrical symptoms.

\*\* May also be generated by some other non-electric transmission hardware system.

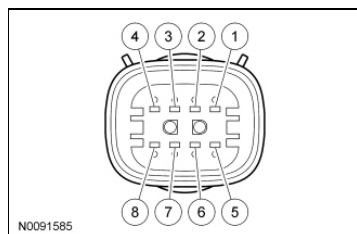


SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

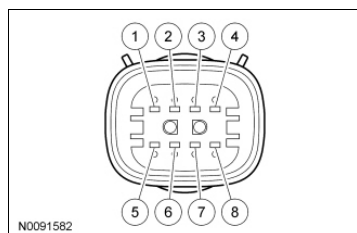
## Transmission Connector Layouts

### Transmission Vehicle Harness - C1274

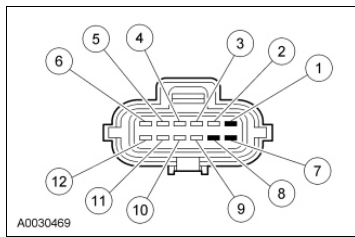


Pin Number	Circuit	Circuit Function
1	391 (RD/YE)	Vehicle power
2	126 (VT/YE)	Torque Converter Clutch (TCC) solenoid
3	359 (GY/RD)	Signal return
4	-	Not used
5	315 (VT/OG)	Shift Solenoid B (SSB)
6	237 (OG/YE)	Shift Solenoid A (SSA)
7	925 (WH/YE)	Electronic Pressure Control (EPC) solenoid
8	923 (OG/BK)	Transmission Fluid Temperature (TFT) input

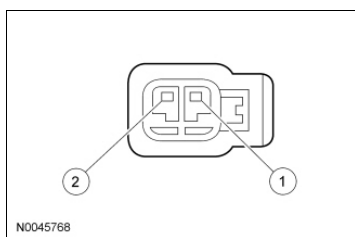
### Transmission Internal Harness - C1274



Pin Number	Circuit	Circuit Function
1	-	Vehicle power to solenoid
2	-	Torque Converter Clutch (TCC)
3	-	Signal return
4	-	Not used
5	-	Shift Solenoid B (SSB)
6	-	Shift Solenoid A (SSA)
7	-	Electronic Pressure Control (EPC) solenoid
8	-	Transmission Fluid Temperature (TFT) input

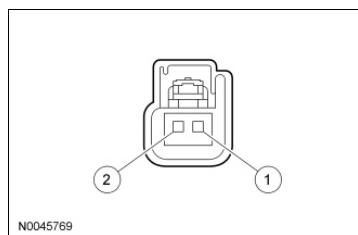
**Transmission Range (TR) Sensor - C167**

Pin Number	Circuit	Circuit Function
1	-	Not used
2	359 (GY/RD)	Signal return
3	1268 (RD/BK)	Transmission Range (TR)3
4	1144 (YE/BK)	TR 1
5	1145 (LB/BK)	TR 2
6	1143 (WH/BK)	TR 4
7	-	Not used
8	-	Not used
9	1789 (VT/WH)	Fused power feed
10	33 (WH/PK)	Starter control
11	140 (BK/PK)	Reverse
12	262 (BN/PK)	Starter to starter interrupt relay

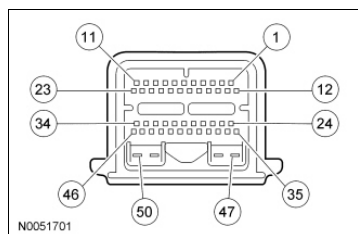
**Output Shaft Speed (OSS) Sensor Harness - C1107**

Pin Number	Circuit	Circuit Function
1	359 (GY/RD)	Signal return
2	136 (DB/YE)	Output Shaft Speed (OSS) sensor

**Turbine Shaft Speed (TSS) Sensor Harness - C143**



Pin Number	Circuit	Circuit Function
1	970 (DG/WH)	Turbine Shaft Speed (TSS) sensor
2	359 (GY/RD)	Signal return

**PCM Harness - C175T**

Pin Number	Circuit	Circuit Function
3	136 (DB/YE)	Output Shaft Speed (OSS) sensor signal
11	925 (WH/YE)	Electronic Pressure Control (EPC) solenoid
15	970 (DG/WH)	Turbine Shaft Speed (TSS) sensor signal
16	1144 (YE/BK)	Transmission Range (TR)1
17	1145 (LB/BK)	TR 2
27	1268 (RD/BK)	TR 3
28	1143 (WH/BK)	TR 4
29	923 (OG/BK)	Transmission Fluid Temperature (TFT) input
41	359 (GY/RD)	Signal return
42	237 (OG/YE)	Shift Solenoid A (SSA)
43	315 (VT/OG)	Shift Solenoid B (SSB)
46	126 (VT/YE)	Torque Converter Clutch (TCC) solenoid

**Transmission Range (TR) Sensor Diagnosis Chart**

Selector Position	PID: TR	PID: TR				PID: TR3_V (volts)
		TR4	TR3	TR2	TR1	TR3_V
Park	P/N	closed	closed	closed	closed	0.0 Volt
In Between	REV	closed	open	closed	closed	1.3-1.8 Volts

Reverse	REV	open	open	closed	closed	1.3-1.8 Volts
In Between	REV	closed	open	closed	closed	1.3-1.8 Volts
Neutral	NTRL	closed	open	open	closed	1.3-1.8 Volts
In Between	OD <sup>a</sup>	open	open	open	closed	1.3-1.8 Volts
Overdrive	OD <sup>a</sup>	open	open	open	open	1.3-1.8 Volts
In Between	Man 2	open	closed	open	open	0.0 Volts
Manual 2	Man 2	open	closed	closed	open	0.0 Volts
In Between	Man 2	open	closed	open	open	0.0 Volts
Manual 1	Man 1	closed	closed	open	open	0.0 Volts

<sup>a</sup> Will read "Drive" if (D) is canceled.

A. TR 3V is the voltage at the PCM pin 27 ( TR 3 Circuit) to signal return.

B. "In Between" reading could be caused by a selector lever cable or TR sensor misaligned or a TR sensor circuit failure of TR 1, TR 2, TR 3 or TR 4.

C. Readings taken from PCM signal pins for TR 1, TR 2, TR 3, TR 4 to signal return.

◆ **Voltages for TR1, TR2, TR4:**

◆ 0 = 0.0 volt.

◆ 1 = 9.0-14.0 volts.

◆ **Voltage for TR3:**

◆ 0 = 0.0 volt.

◆ 1 = 1.3-1.8 volts.

**Wiggle Test Information For Open/Shorts**

- TR 4, TR 3, TR 2 and TR are all closed in PARK. PARK is a good position to check for intermittent open circuits (with diagnostic tool monitoring TR ).
- TR 4, TR 3, TR 2 and TR 1 are all open in (D), so (D) is a good position to check for shorts to ground. To determine the shorted components while observing TR , unplug the TR sensor and see if the short goes away. If the short is still present, unplug the transmission vehicle harness connector and see if the short goes away. If the short is still present, then the short is in the transmission vehicle harness. Remove the suspect circuit(s) wire from the transmission vehicle harness. If the short is still present, then the PCM has an internal failure.







SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 04/19/2011

## Pinpoint Tests - OSC Equipped Vehicle

### Special Tool(s)

 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1565-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Any time an electrical connector or solenoid body is disconnected, inspect the connector for terminal condition, corrosion and contamination. Also inspect the connector seal for damage. Clean, repair or install a new component as required.

### Shift Solenoids Pre-Diagnosis

Use the following shift solenoid operation information when carrying out Pinpoint Test A.

### Solenoid Operation Chart

Selector Lever Position	PCM Commanded Gear	Transmission Shift Solenoids		
		SSA	SSB	TCC
P/R/N	1	ON	OFF	HD
(D)	1	ON	OFF	HD
(D)	2	OFF	OFF	EC
(D)	3	OFF	ON	EC
(D)	4	ON	ON	EC
(D)OFF 1	1	ON	OFF	HD
(D)OFF 2	2	OFF	OFF	EC
(D)OFF 3	3	OFF	ON	EC
Manual 2	2	OFF	OFF	EC
Manual 1	1	ON	OFF	HD

1 <sup>a</sup>	2	OFF	OFF	EC
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<sup>a</sup> When a manual pull-in occurs above a calibrated speed, the transmission will not downshift from the higher gear until the vehicle speed drops below a calibrated speed.

EC = Electronically Controlled

HD = Hydraulically Disabled

### Shift Solenoid Failure Mode Chart "Always Off"

Failed off due to PCM and/or vehicle wiring concerns, shift solenoid electrically or hydraulically stuck off.

	Selector Lever Position		
	(D)	2	1
SSA ALWAYS OFF			
PCM Gear Commanded	Actual Gear Obtained		
1	2	2	2
2	2	2	2
3	3	2*	2*
4	3	2*	2*

\*No engine braking.

	Selector Lever Position		
	(D)	2	1
SSB ALWAYS OFF			
PCM Gear Commanded	Actual Gear Obtained		
1	1	1	1
2	2	2	2
3	2	2	2
4	1	1	1

### Shift Solenoid Failure Mode Chart "Always On"

Failed on due to PCM and/or vehicle wiring concerns, shift solenoid electrically or hydraulically stuck on.

SSA ALWAYS ON	Selector Lever Position		
	(D)	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	1	1	1
2	1	1	1
3	4	2*	2*
4	4	2*	2*

\*No engine braking.

SSB ALWAYS ON	Selector Lever Position		
	(D)	2	1
PCM Gear Commanded	Actual Gear Obtained		
1	4	2*	2*
2	3	2*	2*
3	3	2*	2*
4	4	2*	2*

\*No engine braking.

## Pinpoint Tests

Refer to Wiring Diagrams Cell [29](#) , Transmission Controls for schematic and connector information.

**NOTE:** Refer to all TSBs and On-Line Automotive Service Information System (OASIS) messages that pertain to the transmission concern and follow the procedure as described.



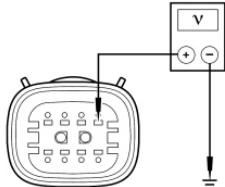
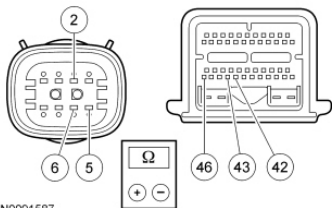
**PINPOINT TEST A: SHIFT AND TCC SOLENOIDS**

**NOTE:** Refer to the Transmission Internal Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Refer to the Transmission Vehicle Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Read and record all DTCs.

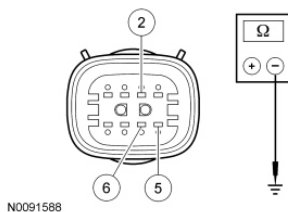
Test Step	Result / Action to Take				
<b>A1 ELECTRONIC DIAGNOSTICS</b>					
<ul style="list-style-type: none"><li>• Select PARK.</li><li>• Ignition OFF.</li><li>• Check to make sure the transmission vehicle harness C1274 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li><li>• Connect the scan tool.</li><li>• Ignition ON.</li><li>• Access the transmission PIDs.</li><li>• <b>Is the scan tool able to access the transmission PIDs?</b></li></ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>				
<b>A2 WIGGLE TEST</b>					
<ul style="list-style-type: none"><li>• Select PIDs to be monitored.</li></ul> <table border="1"><tr><td><b>PID</b></td></tr><tr><td>SSA</td></tr><tr><td>SSB</td></tr><tr><td>TCC</td></tr></table> <ul style="list-style-type: none"><li>• Turn suspect solenoid on.</li><li>• Wiggle all wiring and connectors to the transmission. Monitor the solenoid state for changes.</li><li>• Turn solenoid off.</li><li>• <b>Does the suspect solenoid(s) state change?</b></li></ul>	<b>PID</b>	SSA	SSB	TCC	<p><b>Yes</b> REPAIR open or short to ground in the vehicle harness or connector. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>PID</b>					
SSA					
SSB					
TCC					
<b>A3 SOLENOID FUNCTIONAL CHECK</b>					
<ul style="list-style-type: none"><li>• Monitor each solenoid state.</li><li>• Turn each solenoid ON and OFF.</li><li>• <b>Does the solenoid turn ON and OFF when commanded and can solenoid activation be heard?</b></li></ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> GO to <u>A5</u> .</p>				
<b>A4 VERIFY SHIFT OR TCC SOLENOID OPERATION</b>					
<ul style="list-style-type: none"><li>• Using the scan tool, select the SSA, SSB and/or TCC solenoid PIDs.</li><li>• While driving the vehicle, maintain speed at 48 km/h (30</li></ul>	<p><b>Yes</b> CLEAR all DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to</p>				

<p>mph).</p> <ul style="list-style-type: none"><li>• Command the selected solenoid ON and OFF.</li><li>• Repeat steps for remaining solenoids as needed.</li><li>• <b>Does the transmission upshift/downshift or Torque Converter Clutch (TCC) engage/disengage when commanded?</b></li></ul>	<p><u>Diagnosis By Symptom</u> in this section to diagnose shift or torque converter concern.</p> <p><b>No</b> GO to <u>A5</u> .</p>												
<b>A5 CHECK FOR BATTERY VOLTAGE</b>													
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Transmission Vehicle Harness C1274.</li><li>• Inspect the connector for damaged terminals.</li><li>• Ignition ON.</li><li>• Measure the voltage between the transmission vehicle harness C1274-1, circuit 391 (RD/YE), harness side and ground.</li></ul> <div></div> <ul style="list-style-type: none"><li>• <b>Is the voltage greater than 10 volts?</b></li></ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> REPAIR transmission vehicle harness circuit 391 (RD/YE). TEST the system for normal operation.</p>												
<b>A6 CHECK VEHICLE HARNESS SIGNAL CIRCUITS FOR AN OPEN</b>													
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: PCM C175T.</li><li>• Measure the resistance between the transmission vehicle harness C1274, harness side and PCM C175T, harness side using the following chart.</li></ul> <table><tr><th>Transmission Vehicle Harness</th><th>Circuit</th><th>PCM</th></tr><tr><td>C1274-6</td><td>237 (OG/YE)</td><td>C175T-42</td></tr><tr><td>C1274-5</td><td>315 (VT/OG)</td><td>C175T-43</td></tr><tr><td>C1274-2</td><td>126 (VT/YE)</td><td>C175T-46</td></tr></table> <div></div> <ul style="list-style-type: none"><li>• <b>Is the resistance less than 5 ohms?</b></li></ul>	Transmission Vehicle Harness	Circuit	PCM	C1274-6	237 (OG/YE)	C175T-42	C1274-5	315 (VT/OG)	C175T-43	C1274-2	126 (VT/YE)	C175T-46	<p><b>Yes</b> GO to <u>A7</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit for an open. CLEAR the DTCs. TEST the system for normal operation.</p>
Transmission Vehicle Harness	Circuit	PCM											
C1274-6	237 (OG/YE)	C175T-42											
C1274-5	315 (VT/OG)	C175T-43											
C1274-2	126 (VT/YE)	C175T-46											

# **A7 CHECK VEHICLE HARNESS SIGNAL CIRCUITS FOR SHORT TO GROUND**

- Measure the resistance between transmission vehicle harness C1274, harness side and ground using the following chart.

Transmission Vehicle Harness	Circuit	Ground
C1274-6	237 (OG/YE)	Ground
C1274-5	315 (VT/OG)	Ground
C1274-2	126 (VT/YE)	Ground



- Is the resistance greater than 10,000 ohms?

**Yes**

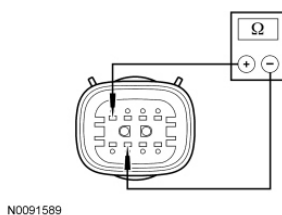
GO to A8.

**No**

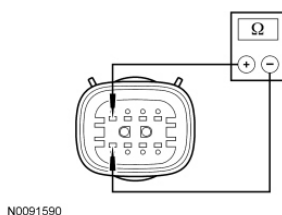
REPAIR the vehicle harness circuit for a short to ground. CLEAR the DTCs. TEST the system for normal operation.

# **A8 CHECK THE TRANSMISSION INTERNAL HARNESS/COMPONENT FOR AN OPEN**

- For Shift Solenoid A (SSA), measure the resistance between C1274-1 and C1274-6.



- For Shift Solenoid B (SSB), measure the resistance between C1274-1 and C1274-5.



- For Torque Converter Clutch (TCC), measure the resistance between C1274-1 and C1274-2.

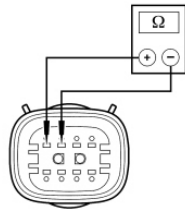
**Yes**

GO to A9

**No**

INSPECT the transmission internal harness for an open. If no open is found, REPLACE the faulty component. CLEAR the DTCs. TEST the system for normal operation.

Component	Resistance Value
SSA	20-30 ohms
SSB	20-30 ohms
TCC	10-16 ohms



N0091591

- Is the resistance within the specification?

#### A9 CHECK THE INTERNAL HARNESS FOR A SHORT TO GROUND

- Measure the resistance between the transmission internal harness C1274, harness side and ground using the following chart.

Transmission Internal Harness	Component	Ground
C1274-1	Power feed	Ground
C1274-6	SSA	Ground
C1274-5	SSB	Ground
C1274-2	TCC	Ground

- Is the resistance greater than 10,000 ohms?

#### Yes

REPLACE the PCM. REFER to [Section 303-14](#) . TEST the system for normal operation.

#### No

REPLACE the transmission internal harness. CLEAR the DTCs. TEST the system for normal operation.

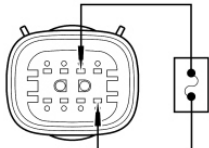
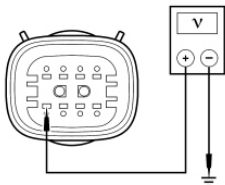
#### PINPOINT TEST B: TFT SENSOR

**NOTE:** Refer to the Transmission Internal Harness Connector illustration within the [Transmission Connector Layouts](#) procedure in this section.

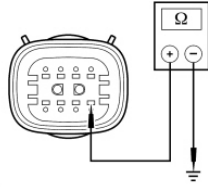
**NOTE:** Refer to the Transmission Vehicle Harness Connector illustration within the [Transmission Connector Layouts](#) procedure in this section.

**NOTE:** Read and record all DTCs.

Test Step	Result / Action to Take
<b>B1 ELECTRONIC DIAGNOSTICS</b>	
<ul style="list-style-type: none"> <li>• Select PARK.</li> <li>• Ignition OFF.</li> </ul>	<b>Yes</b> GO to <b>B2</b> .

<ul style="list-style-type: none"> <li>• Check to make sure the transmission vehicle harness C1274 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Access the transmission PIDs.</li> <li>• <b>Is the scan tool able to access the transmission PIDs?</b></li> </ul>	<p><b>No</b> REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>
<b>B2 ELECTRICAL SIGNAL CHECK</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Transmission Vehicle Harness C1274.</li> <li>• Ignition ON.</li> <li>• Access the Transmission Fluid Temperature (TFT) PID.</li> <li>• <b>Does the scan tool display -40°C (-40°F)?</b></li> </ul>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> REPAIR the vehicle harness circuit 923 (OG/BK) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.</p>
<b>B3 CHECK THE VEHICLE HARNESS SIGNAL CIRCUIT</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper between C1274-3, circuit 359 (GY/RD), harness side and C1274-8, circuit 923 (OG/BK), harness side.</li> </ul>  <p>N0091593</p> <ul style="list-style-type: none"> <li>• <b>Does the scan tool display 145°C-151°C (293°F-302°F)?</b></li> </ul>	<p><b>Yes</b> GO to <u>B5</u> .</p> <p><b>No</b> GO to <u>B4</u> .</p>
<b>B4 CHECK THE TFT INPUT CIRCUIT</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between C1274-8, circuit 923 (OG/BK), harness side and ground.</li> </ul>  <p>N0091753</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage between 4.8 and 5.1 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>B5</u> .</p> <p><b>No</b> INSPECT the vehicle harness circuit 923 (OG/BK) for an open. If an open circuit is not found, REPLACE the PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p>
<b>B5 CHECK THE RESISTANCE OF THE TRANSMISSION INTERNAL HARNESS</b>	

- Measure the resistance between the transmission internal harness C1274-8, component side and ground.



N0091594

- Is the resistance greater than 10,000 ohms?

**Yes**GO to **B6**.**No**

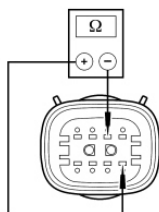
REPLACE the transmission internal harness. CLEAR the DTCs. TEST the system for normal operation.

#### **B6 CHECK RESISTANCE OF THE TRANSMISSION INTERNAL HARNESS/ TFT SENSOR**

- Measure the resistance between the transmission internal harness C1274-3, and C1274-8, component side using the following chart.

#### **TRANSMISSION FLUID TEMPERATURE (TFT)**

°C	°F	Resistance (Ohms)
-40 to -20	-40 to -4	967K-284K
-19 to -1	-3 to 31	284K-100K
0-20	32-68	100K-37K
21-40	69-104	37K-16K
41-70	105-158	16K-5K
71-90	159-194	5K-2.7K
91-110	195-230	2.7K-1.5K
111-130	231-266	1.5K-0.8K
131-150	267-302	0.8K-0.54K



N0091595

- Does the temperature to resistance specifications match?

**Yes**

REFER to Diagnosis By Symptom in this section to diagnose an overheating concern.

**No**

REPLACE the TFT sensor. CLEAR the DTCs. TEST the system for normal operation.

**PINPOINT TEST C: TR SENSOR**

**NOTE:** Refer to the Transmission Range (TR) Sensor Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Refer to the Transmission Range (TR) Sensor Diagnosis Chart within the Transmission Connector Layouts procedure in this section.

**NOTE:** Read and record all DTCs.

Test Step	Result / Action to Take
<b>C1 VERIFY DTCs</b>	
<ul style="list-style-type: none"> <li>• Select PARK.</li> <li>• Ignition OFF.</li> <li>• Check to make sure the transmission vehicle harness C1274 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• <b>NOTE:</b> DTCs P0705 and P0708 cannot set by an incorrectly adjusted Transmission Range (TR) sensor.</li> <li>• Retrieve DTCs.</li> <li>• <b>Are only DTCs P0705 and P0708 present?</b></li> </ul>	<p><b>Yes</b> GO to <u>C4</u> .</p> <p><b>No</b> GO to <u>C2</u> .</p>
<b>C2 VERIFY TR SENSOR ALIGNMENT</b>	
<ul style="list-style-type: none"> <li>• Check to make sure the TR sensor C167 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li> <li>• Apply the park brake.</li> <li>• Select NEUTRAL.</li> <li>• Disconnect the selector lever cable/linkage from the manual control lever.</li> <li>• Verify that the TR Sensor Alignment Gauge fits in the appropriate slots.</li> <li>• <b>Is the TR sensor adjustment OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> ADJUST the TR sensor. PLACE the selector lever in park. CLEAR the DTCs. TEST the system for normal operation. GO to <u>C3</u> .</p>
<b>C3 VERIFY SELECTOR LEVER CABLE ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Place the transmission manual lever in the (D) position.</li> <li>• Reconnect the selector lever cable.</li> <li>• Verify that the selector lever cable is correctly adjusted. Refer to <u>Section 307-05</u> .</li> <li>• <b>Is the selector lever cable correctly adjusted?</b></li> </ul>	<p><b>Yes</b> GO to <u>C4</u> .</p> <p><b>No</b> ADJUST the selector lever cable. REFER to <u>Section 307-05</u> .</p>
<b>C4 CHECK ELECTRICAL SIGNAL OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Select PARK.</li> </ul>	<p><b>Yes</b> REPAIR as required. CLEAR the DTCs. TEST the system for normal operation.</p>

<ul style="list-style-type: none"><li>• Disconnect: TR Sensor C167.</li><li>• <b>NOTICE: Do not pry on connector. This will damage the connector and result in a transmission concern.</b></li><li>• Inspect both ends of C167 for damage or pushed-out terminals, corrosion, loose wires and missing or damaged seals.</li><li>• <b>Are the connector, terminals or harness damaged?</b></li></ul>	<b>No</b> GO to <u>C5</u> .															
<b>C5 CHECK ELECTRICAL SYSTEM OPERATION ( TR AND PCM)</b>																
<ul style="list-style-type: none"><li>• Connect: TR Sensor C167.</li><li>• Ignition ON.</li><li>• Access the transmission PIDs.</li><li>• Place the selector lever into each gear position and stop.</li><li>• Observe the following PIDs: TR, TR1, TR2, TR3, TR4, TR3V and TR_F while wiggling harness, tapping on sensor and/or driving the vehicle.</li><li>• Compare the PIDs to the TR Sensor Diagnosis Chart.</li><li>• <b>Do the PIDs TR, TR1, TR2, TR3, TR4 and TR3V match the Transmission Range (TR) Sensor Diagnosis Chart, and do PIDs remain steady when the harness is wiggled, the sensor is tapped or the vehicle driven?</b></li></ul>	<b>Yes</b> The problem is not in the TR sensor system. REFER to <u>Diagnosis By Symptom</u> in this section for further diagnosis.  <b>No</b> If the PIDs change when wiggling harness, tapping on the sensor or driving the vehicle, the problem may be intermittent.  GO to <u>C6</u> .															
<b>C6 CHECK TR SENSOR OPERATION</b>																
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: TR sensor C167.</li><li>• <b>NOTICE: Do not pry on connector. This will damage the connector and result in a transmission concern.</b></li><li>• Using the Transmission Range (TR) Sensor Diagnosis Chart, measure the resistance of the TR sensor with the selector lever in each range position using the following chart. Compare the measurements to the Transmission Range (TR) Sensor Diagnosis Chart.</li></ul>  <b>TRANSMISSION RANGE (TR) Sensor</b> <table><tr><th>TR Sensor Terminal</th><th>PID TR</th><th>TR Sensor Terminal</th></tr><tr><td>2</td><td>TR 3</td><td>3</td></tr><tr><td>2</td><td>TR 1</td><td>4</td></tr><tr><td>2</td><td>TR 2</td><td>5</td></tr><tr><td>2</td><td>TR 4</td><td>6</td></tr></table>	TR Sensor Terminal	PID TR	TR Sensor Terminal	2	TR 3	3	2	TR 1	4	2	TR 2	5	2	TR 4	6	<b>Yes</b> Concern is not in the TR sensor, GO to <u>C7</u> .  <b>No</b> INSTALL a new TR sensor. CLEAR the DTCs. TEST the system for normal operation.
TR Sensor Terminal	PID TR	TR Sensor Terminal														
2	TR 3	3														
2	TR 1	4														
2	TR 2	5														
2	TR 4	6														



<ul style="list-style-type: none"><li>• Do the resistance measurements match the Transmission Range (TR) Sensor Diagnosis Chart?</li></ul>																
<b>C7 CHECK VEHICLE TRANSMISSION HARNESS CIRCUITS FOR AN OPEN</b>																
<ul style="list-style-type: none"><li>• Disconnect: PCM C175T.</li><li>• Disconnect: TR C167.</li><li>• Measure the resistance between TR C167 and PCM C175T, harness side using the following chart.</li></ul> <table><tr><th>TR</th><th>Circuit</th><th>PCM</th></tr><tr><td>C167-3</td><td>1268 (RD/BK)</td><td>C175T-27</td></tr><tr><td>C167-4</td><td>1144 (YE/BK)</td><td>C175T-16</td></tr><tr><td>C167-5</td><td>1145 (LB/BK)</td><td>C175T-17</td></tr><tr><td>C167-6</td><td>1143 (WH/BK)</td><td>C175T-28</td></tr></table> <ul style="list-style-type: none"><li>• Is the resistances less than 5 ohms?</li></ul>	TR	Circuit	PCM	C167-3	1268 (RD/BK)	C175T-27	C167-4	1144 (YE/BK)	C175T-16	C167-5	1145 (LB/BK)	C175T-17	C167-6	1143 (WH/BK)	C175T-28	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b> REPAIR the vehicle transmission harness circuit which is open. CLEAR the DTCs. TEST the system for normal operation.</p>
TR	Circuit	PCM														
C167-3	1268 (RD/BK)	C175T-27														
C167-4	1144 (YE/BK)	C175T-16														
C167-5	1145 (LB/BK)	C175T-17														
C167-6	1143 (WH/BK)	C175T-28														
<b>C8 CHECK THE VEHICLE TRANSMISSION HARNESS CIRCUITS FOR A SHORT TO GROUND</b>																
<ul style="list-style-type: none"><li>• Measure the resistance between the TR C167 harness side and ground using the following chart.</li></ul> <table><tr><th>TR</th><th>Circuit</th><th>Ground</th></tr><tr><td>C167-3</td><td>1268 (RD/BK)</td><td>Ground</td></tr><tr><td>C167-4</td><td>1144 (YE/BK)</td><td>Ground</td></tr><tr><td>C167-5</td><td>1145 (LB/BK)</td><td>Ground</td></tr><tr><td>C167-6</td><td>1143 (WH/BK)</td><td>Ground</td></tr></table> <ul style="list-style-type: none"><li>• Are the resistances greater than 10,000 ohms?</li></ul>	TR	Circuit	Ground	C167-3	1268 (RD/BK)	Ground	C167-4	1144 (YE/BK)	Ground	C167-5	1145 (LB/BK)	Ground	C167-6	1143 (WH/BK)	Ground	<p><b>Yes</b> GO to <u>C9</u> .</p> <p><b>No</b> REPAIR the vehicle transmission harness circuit shorted to ground. CLEAR the DTCs. TEST the system for normal operation.</p>
TR	Circuit	Ground														
C167-3	1268 (RD/BK)	Ground														
C167-4	1144 (YE/BK)	Ground														
C167-5	1145 (LB/BK)	Ground														
C167-6	1143 (WH/BK)	Ground														
<b>C9 CHECK FOR A SHORT BETWEEN TR AND PCM INPUT SIGNAL CIRCUITS</b>																
<ul style="list-style-type: none"><li>• Measure the resistance between the TR sensor C167 pins harness side using the following chart.</li></ul> <table><tr><th>TR</th><th>Circuit</th><th>TR</th></tr><tr><td>C167-2</td><td>359 (GY/RD)</td><td>C167-3, 4, 5, 6</td></tr><tr><td>C167-3</td><td>1268 (RD/BK)</td><td>C167-4, 5, 6</td></tr></table>	TR	Circuit	TR	C167-2	359 (GY/RD)	C167-3, 4, 5, 6	C167-3	1268 (RD/BK)	C167-4, 5, 6	<p><b>Yes</b> REPLACE the PCM. REFER to <u>Section 303-14</u> . RECONNECT all components. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuits having less than 10,000 ohms between other TR /PCM input signal circuits that are shorted together. RECONNECT all components. CLEAR</p>						
TR	Circuit	TR														
C167-2	359 (GY/RD)	C167-3, 4, 5, 6														
C167-3	1268 (RD/BK)	C167-4, 5, 6														

C167-4	1144 (YE/BK)	C167-5, 6	the DTCs. TEST the system for normal operation.
C167-5	1145 (LB/BK)	C167-6	
<ul style="list-style-type: none"> <li>• Are all the resistances greater than 10,000 ohms?</li> </ul>			

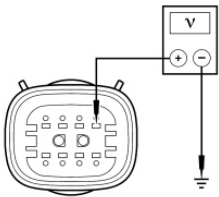
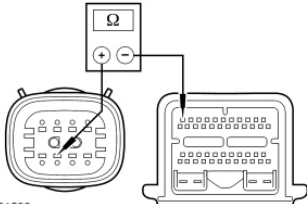
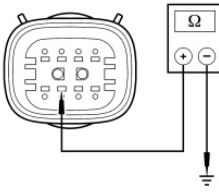
**PINPOINT TEST D: EPC SOLENOID**

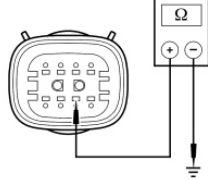
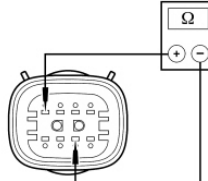
**NOTE:** Refer to the Transmission Internal Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Refer to the Transmission Vehicle Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Read and record all DTCs.

Test Step	Result / Action to Take
<b>D1 ELECTRONIC DIAGNOSTICS</b>	
<ul style="list-style-type: none"> <li>• Select PARK.</li> <li>• Ignition OFF.</li> <li>• Check to make sure the transmission vehicle harness C1274 is fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Access the transmission PIDs.</li> <li>• <b>Is the scan tool able to access the transmission PIDs?</b></li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>
<b>D2 SOLENOID FUNCTIONAL TEST</b>	
<ul style="list-style-type: none"> <li>• Install the Transmission Fluid Pressure Gauge into the line pressure tap.</li> <li>• Monitor the Transmission Fluid Pressure Gauge.</li> <li>• With the engine running above 1,200 rpm, command the LINEDSD# PID to change the line pressure.</li> <li>• <b>Does the pressure reading change when commanded?</b></li> </ul>	<p><b>Yes</b> CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>D3</u> .</p>
<b>D3 CHECK FOR BATTERY VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Transmission Vehicle Harness C1274 .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the transmission vehicle harness C1274-1, circuit 391 (RD/YE), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>D4</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit 391 (RD/YE). CLEAR the DTCs. TEST the system for normal operation.</p>

 <p>N0091600</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<p><b>D4 CHECK VEHICLE HARNESS SIGNAL CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175T.</li> <li>• Measure the resistance between the transmission vehicle harness C1274-7 and PCM C175T-11, circuit 925 (WH/YE), harness side.</li> </ul>  <p>N0091596</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D5</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit 925 (WH/YE) for an open. CLEAR the DTCs. TEST the system for normal operation.</p>
<p><b>D5 CHECK VEHICLE HARNESS SIGNAL CIRCUIT FOR SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between transmission vehicle harness C1274-7, 925 (WH/YE), harness side and ground.</li> </ul>  <p>N0091597</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D6</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit 925 (WH/YE) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.</p>
<p><b>D6 CHECK TRANSMISSION INTERNAL HARNESS FOR A SHORT TO GROUND</b></p>	

<ul style="list-style-type: none"> <li>• Measure the resistance between the transmission internal harness C1274-7, component side and ground.</li> </ul>  <p>N0091598</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> REPAIR the transmission internal harness circuit for a short to ground. CLEAR the DTCs. TEST the system for normal operation.</p>
<p><b>D7 CHECK THE TRANSMISSION INTERNAL HARNESS/COMPONENT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the transmission internal harness C1274-1 and C1274-7, component side.</li> </ul>  <p>N0091599</p> <ul style="list-style-type: none"> <li>• Is the resistance within 2.48 to 5.66 ohms?</li> </ul>	<p><b>Yes</b> REPLACE the PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> INSPECT the transmission internal harness for an open. If no open is found, REPLACE the EPC solenoid. CLEAR the DTCs. TEST the system for normal operation.</p>

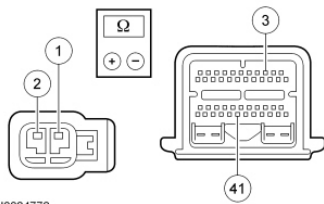
#### PINPOINT TEST E: OSS SENSOR

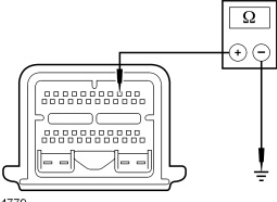
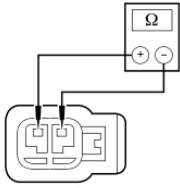
**NOTE:** Refer to the Output Shaft Speed (OSS) Sensor Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Refer to the Transmission Vehicle Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Read and record all DTCs.

Test Step	Result / Action to Take
<b>E1 ELECTRONIC DIAGNOSTICS</b>	
<ul style="list-style-type: none"> <li>• Select PARK.</li> <li>• Ignition OFF.</li> <li>• Check to make sure the transmission vehicle harness C1274 and the Output Shaft Speed (OSS) sensor C1107 are fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission</p>

<ul style="list-style-type: none"><li>• Connect the scan tool.</li><li>• Ignition ON.</li><li>• Access the transmission PIDs.</li><li>• <b>Is the scan tool able to access the transmission PIDs?</b></li></ul>	PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.									
<b>E2 DRIVE CYCLE TEST</b>										
<ul style="list-style-type: none"><li>• While monitoring the OSS_SRC PID, drive the vehicle so that the transmission upshifts and downshifts through all gears.</li><li>• <b>Does the OSS_SRC PID increase and decrease with vehicle speed?</b></li></ul>	<p><b>Yes</b> CLEAR the DTCs. ROAD TEST to verify if concern is still present. If concern is still present, REFER to <u>Diagnosis By Symptom</u> in this section.</p> <p><b>No</b> If the OSS_SRC PID does not increase and decrease with vehicle speed or if the sensor signal is erratic or the sensor signal is consistent/unchanging output, GO to <u>E3</u> .</p>									
<b>E3 CHECK THE TRANSMISSION VEHICLE HARNESS FOR OPENS</b>										
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: PCM C175T.</li><li>• Disconnect: OSS Sensor C1107.</li><li>• Measure the resistance between PCM C175T and OSS sensor C1107, harness side using the following table.</li></ul> <table border="1"><thead><tr><th>OSS Terminal</th><th>Circuit Number</th><th>PCM Terminal</th></tr></thead><tbody><tr><td>C1107-2</td><td>136 (DB/YE)</td><td>C175T-3</td></tr><tr><td>C1107-1</td><td>359 (GY/RD)</td><td>C175T-41</td></tr></tbody></table> <div><p>N0084778</p></div> <ul style="list-style-type: none"><li>• <b>Is the resistance less than 5 ohms?</b></li></ul>	OSS Terminal	Circuit Number	PCM Terminal	C1107-2	136 (DB/YE)	C175T-3	C1107-1	359 (GY/RD)	C175T-41	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit for an open. CLEAR the DTCs. TEST the system for normal operation.</p>
OSS Terminal	Circuit Number	PCM Terminal								
C1107-2	136 (DB/YE)	C175T-3								
C1107-1	359 (GY/RD)	C175T-41								
<b>E4 CHECK THE TRANSMISSION VEHICLE HARNESS FOR SHORT TO GROUND</b>										

<ul style="list-style-type: none"> <li>• Measure the resistance between PCM C175T-3, circuit 136 (DB/YE), harness side and ground.</li> </ul>  <p>N0084779</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E5</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit 136 (DB/YE) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.</p>
<b>E5 CHECK RESISTANCE OF THE OSS SENSOR</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between OSS sensor pins 1 and 2, component side.</li> </ul>  <p>N0065030</p> <ul style="list-style-type: none"> <li>• Is the resistance between 400-500 ohms at 25°C (77°F)?</li> </ul>	<p><b>Yes</b> REPLACE the PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> REPLACE the OSS sensor. CLEAR the DTCs. TEST the system for normal operation.</p>

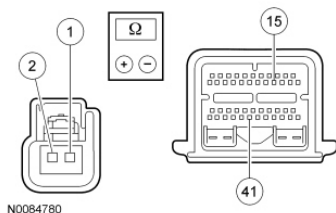
**PINPOINT TEST F: TSS SENSOR**

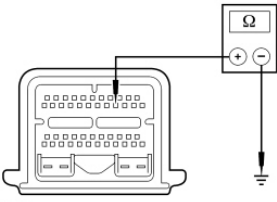
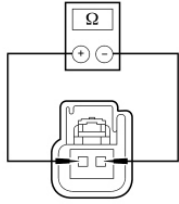
**NOTE:** Refer to the Turbine Shaft Speed (TSS) Sensor Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Refer to the Transmission Vehicle Harness Connector illustration within the Transmission Connector Layouts procedure in this section.

**NOTE:** Read and record all DTCs.

Test Step	Result / Action to Take
<b>F1 ELECTRONIC DIAGNOSIS</b>	
<ul style="list-style-type: none"> <li>• Select PARK.</li> <li>• Ignition OFF.</li> <li>• Check to make sure the transmission vehicle harness C1274 and the Turbine Shaft Speed (TSS) sensor C143 are fully seated, terminals are fully engaged in the connector and are in good condition before proceeding.</li> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Access the transmission PIDs.</li> </ul>	<p><b>Yes</b> GO to <u>F2</u> .</p> <p><b>No</b> REPEAT procedure to access the transmission PIDs. If the scan tool did not access the transmission PIDs, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis of PCM.</p>

<ul style="list-style-type: none"><li>• Is the scan tool able to access the transmission PIDs?</li></ul>										
<b>F2 DRIVE CYCLE TEST</b>										
<ul style="list-style-type: none"><li>• While monitoring the TSS PID, drive the vehicle so that the transmission upshifts and downshifts through all gears.</li><li>• Does the TSS PID increase and decrease with engine and vehicle speed?</li></ul>	<p><b>Yes</b> REFER to <u>Diagnosis By Symptom</u> in this section for concern diagnosis.</p> <p><b>No</b> If the TSS PID does not increase and decrease with engine and vehicle speed or if the sensor signal is erratic or the sensor signal is consistent/unchanging output, GO to <u>F3</u> .</p>									
<b>F3 CHECK THE TRANSMISSION VEHICLE HARNESS FOR OPENS</b>										
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: PCM C175T.</li><li>• Disconnect: TSS Sensor C143.</li><li>• Measure the resistance between PCM C175T and TSS sensor C143, harness side using the following table.</li></ul> <table><tr><th>TSS Terminal</th><th>Circuit Number</th><th>PCM Terminal</th></tr><tr><td>C143-1</td><td>970 (DG/WH)</td><td>C175T-15</td></tr><tr><td>C143-2</td><td>359 (GY/RD)</td><td>C175T-41</td></tr></table> <div><p>N0084780</p></div> <ul style="list-style-type: none"><li>• Is the resistance less than 5 ohms?</li></ul>	TSS Terminal	Circuit Number	PCM Terminal	C143-1	970 (DG/WH)	C175T-15	C143-2	359 (GY/RD)	C175T-41	<p><b>Yes</b> GO to <u>F4</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit for an open. CLEAR the DTCs. TEST the system for normal operation.</p>
TSS Terminal	Circuit Number	PCM Terminal								
C143-1	970 (DG/WH)	C175T-15								
C143-2	359 (GY/RD)	C175T-41								
<b>F4 CHECK THE TRANSMISSION VEHICLE HARNESS FOR SHORT TO GROUND</b>										
<ul style="list-style-type: none"><li>• Measure the resistance between PCM C175T-15, circuit 970 (DG/WH), harness side and ground.</li></ul>	<p><b>Yes</b> GO to <u>F5</u> .</p> <p><b>No</b> REPAIR the transmission vehicle harness circuit 970 (DG/WH) for a short to ground. CLEAR the DTCs. TEST the system for normal operation.</p>									

 <p>N0064782</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>F5 CHECK RESISTANCE OF THE TSS SENSOR</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the TSS sensor terminals 1 and 2, component side.</li> </ul>  <p>N0065031</p> <ul style="list-style-type: none"> <li>• Is the resistance within 480-590 ohms at 25°C (77°F)?</li> </ul>	<p><b>Yes</b> REPLACE the PCM. REFER to <a href="#">Section 303-14</a> . CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> REPLACE the TSS sensor. CLEAR the DTCs. TEST the system for normal operation.</p>

**PINPOINT TEST G: SOLENOID MECHANICAL FAILURE**

**NOTE:** Repair all other DTCs before repairing the following DTCs: P1714, P1715 and P1740.

Test Step	Result / Action to Take
<b>G1 ELECTRONIC DIAGNOSIS</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Carry out Key ON Engine OFF (KOEO) Test.</li> <li>• Are only DTCs P1714, P1715 and P1740 present?</li> </ul>	<p><b>Yes</b> INSTALL a new solenoid and/or body. REFER to the <a href="#">Diagnostic Trouble Code (DTC) Charts</a> in this section for code description. GO to <a href="#">G2</a> .</p> <p><b>No</b> REPAIR the other DTCs first. CLEAR the DTCs. CARRY OUT Transmission Drive Cycle Test. TEST the system for normal operation.</p>
<b>G2 TRANSMISSION DRIVE CYCLE TEST</b>	
<ul style="list-style-type: none"> <li>• Carry out Transmission Drive Cycle Test.</li> <li>• Retrieve the DTCs.</li> <li>• Does the vehicle upshift and downshift OK?</li> </ul>	<p><b>Yes</b> GO to <a href="#">G3</a> .</p> <p><b>No</b> REFER to <a href="#">Diagnosis By Symptom</a> in this section to diagnose shift concerns.</p>
<b>G3 RETRIEVE the DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Carry out Key ON Engine OFF (KOEO) Test until continuous DTCs are displayed.</li> </ul>	<p><b>Yes</b> REPLACE the PCM. REFER to <a href="#">Section 303-14</a> . ROAD TEST the vehicle and REPEAT the self-test.</p>



<ul style="list-style-type: none"> <li>• Are DTCs P1714, P1715 and P1740 still present?</li> </ul>	<p>No</p> <p>Testing completed. If a concern still exists, REFER to <u>Diagnosis By Symptom</u> in this section.</p>
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SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

## Special Testing Procedures

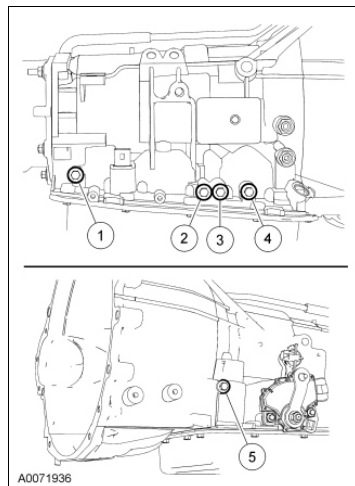
### Special Tool(s)

 ST1992-A	Air Test Plate, Transmission 307-246 (T92P-7006-A)
 ST1555-A	Transmission Fluid Pressure Gauge 307-004 (T57L-77820-A)
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

The special tests are designed to aid the technician in diagnosing the hydraulic and mechanical portion of the transmission.

### Engine Idle Speed Check

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the engine idle speed.



Item	Part Number	Description
1	390318	Direct clutch pressure tap
2	390318	Forward clutch pressure tap
3	390318	Electronic Pressure Control (EPC) pressure tap
4	390318	Intermediate clutch pressure tap
5	390318	Line pressure tap

### Line Pressure Test

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** Carry out the Line Pressure Test prior to carrying out the Stall Speed Test. If the line pressure is low at stall, do not carry out Stall Speed Test or further transmission damage will occur. Do not maintain Wide Open Throttle (WOT) in any transmission range for more than 5 seconds.

This test verifies that the line pressure is within specification.

1. Connect Transmission Fluid Pressure Gauge to line pressure tap.
2. Start the engine and check line pressures. Refer to the Line Pressure Chart to determine if line pressure is within specification.

### Line Pressure Chart

Application	Range	Idle		WOT	
		EPC	Line Pressure	EPC	Line Pressure
All	P, N	34-276 kPa (5-40 psi)	276-689 kPa (40-100 psi)	N/A	N/A
	(D), 2, 1	34-276 kPa (5-40 psi)	276-689 kPa (40-100 psi)	689-793 kPa (100-115 psi)	1,172-1,586 kPa (170-230 psi)
	R	172-207 kPa (25-30 psi)	483-862 kPa (70-125 psi)	586-655 kPa (85-95 psi)	1,124-2,068 kPa (250-300 psi)

3. Place the ignition switch in the OFF position. If line pressure is not within specification, check Electronic Pressure Control (EPC) pressure.
4. Connect Transmission Fluid Pressure Gauge to the EPC pressure tap.
5. Start the engine and check EPC pressure. Refer to the Line Pressure Chart for specifications.
6. If EPC pressure is not within specification, **GO to Pinpoint Test E** to diagnose EPC operation. If EPC operation is OK, refer to the Line Pressure Diagnosis Chart for line pressure concern causes.
7. When the pressure tests are completed, install the pressure tap plugs.
  - Tighten to 12 Nm (106 lb-in).

### Line Pressure Diagnosis Chart

Test Results	Possible Source
High At Idle - In All Positions	<ul style="list-style-type: none"> <li>• Wiring harnesses</li> </ul>

	<ul style="list-style-type: none"> <li>• Run Self Test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual</li> <li>• Electronic Pressure Control (EPC) solenoid</li> <li>• Main regulator valve</li> </ul>
Low At Idle - In All Positions	<ul style="list-style-type: none"> <li>• Low transmission fluid level</li> <li>• Control bodies</li> <li>• Transmission fluid leakage in pump</li> <li>• Damaged gaskets on separator valve</li> <li>• Damaged separator plate</li> <li>• Restricted inlet filter</li> <li>• Case bolts</li> <li>• Loose main control valve body</li> <li>• EPC solenoid O-ring</li> <li>• EPC solenoid bracket</li> <li>• Case</li> <li>• Sticking main regulator valve</li> <li>• Damaged inlet tube seal on inlet filter</li> </ul>
Low In Park Only	<ul style="list-style-type: none"> <li>• Valve body</li> <li>• Low/reverse servo</li> </ul>
Low In Reverse Only	<ul style="list-style-type: none"> <li>• Separator plate</li> <li>• Low/reverse servo or valve bodies</li> <li>• Reverse clutch</li> </ul>
Low In Neutral Only	<ul style="list-style-type: none"> <li>• Valve body</li> </ul>
Low In Overdrive (O/D) Only	<ul style="list-style-type: none"> <li>• Forward clutch</li> <li>• Valve body</li> </ul>
Low In 1st Position Only	<ul style="list-style-type: none"> <li>• Forward clutch</li> <li>• Valve body</li> <li>• Low/reverse servo</li> </ul>
Low In 2nd Only	<ul style="list-style-type: none"> <li>• Intermediate clutch</li> <li>• Valve bodies</li> <li>• Forward clutch</li> </ul>

### Stall Speed Test

**⚠ WARNING:** Block all wheels, set the parking brake and firmly apply the service brake to reduce the risk of vehicle movement during this procedure. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** Carry out Line Pressure Test prior to carrying out Stall Speed Test. If the line pressure is low at stall, do not carry out Stall Speed Test or further transmission damage will occur.

The Stall Speed Test checks the following:

- Torque Converter Clutch (TCC) operation and installation
- Holding ability of the forward clutch

- Reverse clutch (the low-reverse bands)
- Planetary One-Way Clutch (OWC)
- Engine driveability

Conduct this test with the engine coolant and transmission fluid at correct levels and at normal operating temperature.

Apply the park brake firmly for each Stall Speed Test.

1. Find the specified stall rpm for the vehicle; refer to the Stall Speed chart.

### Stall Speed

Application	Min.	Max.
4.6L 2V	2,065	2,409
4.6L Police applications	2,377	2,757

2. Connect a scan tool.

3. **NOTE:** If the engine rpm recorded by the scan tool exceeds the maximum limits, release the accelerator pedal immediately because clutch or band slippage is indicated.

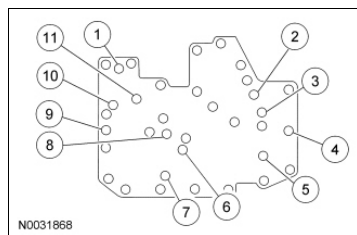
In each of the following selector lever positions, R, (D), 2, 1 press the accelerator pedal to the floor and hold it just long enough to let the engine get to Wide Open Throttle (WOT). While conducting this test, do not hold the throttle plate open for more than 5 seconds at a time.

4. Note the results in each position.
5. After each position, move the selector lever to NEUTRAL and run the engine at 1,000 rpm for about 15 seconds to cool the torque converter before making the next test.
6. Refer to the Stall Speed Diagnosis Chart for corrective actions.

### Stall Speed Diagnosis Chart

Selector Position	Stall Speeds High	Stall Speeds Low
(D)	Planetary One-Way Clutch (OWC)	
(D), 2 and 1	Forward Clutch or Intermediate Clutch	
R, (D), 2, 1	Carry Out Pressure Test	Torque Converter Stator OWC or Engine Driveability Concerns
R	Reverse Clutch or Low Reverse Band or Servo	

### Air Pressure Tests

**Transmission Air Test Plate**

Item	Part Number	Description
1	-	Converter bypass
2	-	Direct clutch
3	-	Forward clutch
4	-	2-3 accumulator, top
5	-	2-3 accumulator, bottom
6	-	Reverse servo
7	-	Overdrive (O/D) servo, apply
8	-	O/D servo, release
9	-	Intermediate clutch
10	-	Reverse clutch
11	-	1-2 accumulator, apply

A no-drive condition can exist even with correct transmission fluid pressure because of inoperative clutches or bands. An erratic shift can be located through a series of checks by substituting air pressure for transmission fluid pressure to determine the location of the malfunction.

Follow the procedure to determine the location of the inoperative clutch or band by introducing air pressure into the various test plate passages.

**NOTE:** Use only dry, regulated 276 kPa (30 psi) maximum air pressure.

Apply air to the appropriate passage(s). A dull thud should be felt or heard or movement could be observed when the clutch component applies. There should be no hissing sound when the component is applied.

Cover the vent hole in the Transmission Air Test Plate with a clean, lint-free shop towel to prevent spray when the air is applied. Plugging the vent hole during testing will result in inaccurate results.

1. **⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

Drain the transmission fluid and remove the transmission fluid pan.

2. Remove the main control valve body.
3. Install Transmission Air Test Plate and gasket. Tighten bolts to 10 Nm (89 lb-in).
4. **NOTE:** Do not apply air to the Transmission Air Test Plate vent hole.

Apply air to the appropriate clutch port (refer to the Transmission Air Test Plate illustration). A dull thud may be heard or movement felt when the component is applied or released. If clutch seals or check balls are leaking a hissing sound may be heard.

If the servos do not operate, disassemble, clean and inspect them to locate the source of the concern.

If air pressure applied to the clutch passages fails to operate a clutch, or operates clutches simultaneously, inspect the fluid passages in the case.

If air pressure applied to the accumulator fails to operate an accumulator, remove and inspect case passages and piston.

### Clutch Pressure Test

Transmission Pressures with TP at 1.5 Volts and Vehicle Speed Above 8 km/h (5 mph)					
Gear	EPC Tap <sup>1</sup>	Line Pressure Tap	Forward Clutch Tap	Intermediate Clutch Tap	Direct Clutch Tap
M1	124-241 kPa (18-35 psi)	517-655 kPa (75-95 psi)	517-655 kPa (75-95 psi)	0-34 kPa  (0-5 psi)	0-34 kPa  (0-5 psi)
M2	276-345 kPa (40-50 psi)	689-814 kPa (100-118 psi)	689-814 kPa (100-118 psi)	689-814 kPa (100-118 psi)	0-34 kPa  (0-5 psi)
1	124-241 kPa (18-35 psi)	413-607 kPa (60-88 psi)	413-607 kPa (60-88 psi)	0-34 kPa  (0-5 psi)	0-34 kPa  (0-5 psi)
2	276-345 kPa (40-50 psi)	662-772 kPa (96-112 psi)	662-772 kPa (96-112 psi)	662-772 kPa (96-112 psi)	0-34 kPa  (0-5 psi)
3	276-345 kPa (40-50 psi)	717-772 kPa (104-112 psi)	717-772 kPa (104-112 psi)	717-772 kPa (104-112 psi)	717-772 kPa (104-112 psi)
4	241-310 kPa (35-45 psi)	607-717 kPa (88-104 psi)	0-34 kPa  (0-5 psi)	607-717 kPa (88-104 psi)	607-717 kPa (88-104 psi)

<sup>1</sup> EPC readings will vary due to PCM strategy. These values are approximate pressures. Actual clutch apply pressures should be within 0-103 kPa (0-15 psi) of line pressure. For information on testing, refer to the Clutch Pressure Test in this section.

The Clutch Pressure Test will diagnose a low-pressure condition or leakage in a clutch circuit. A difference of 103 kPa (15 psi) or more between the clutch pressure and line pressure will prevent a normal shift.

- ⚠ WARNING: If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.**

**NOTICE: Transmission Fluid Pressure Gauges affect the shift quality of the transmission. Care must be taken not to accelerate or decelerate rapidly. Possible transmission failure may result.**

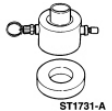
Attach the Transmission Fluid Pressure Gauges to the line pressure tap and the appropriate clutch pressure tap according to Band/Clutch Application Chart. Transmission Fluid Pressure Gauges must be accurate enough to distinguish a 103 kPa (15 psi) difference. (If this test is done in conjunction with a control pressure test, Transmission Fluid Pressure Gauges will be attached to all pressure taps.) Have sufficient flexible hose available to read the Transmission Fluid Pressure Gauges in the vehicle.

2. Drive the vehicle. When pressure is applied to the clutch, note the difference between the Transmission Fluid Line Pressure Gauge and the corresponding Transmission Fluid Clutch Pressure Gauge.
  3. If the difference in pressures is less than 103 kPa (15 psi), the corresponding clutch circuit does not have a pressure loss. The Transmission Fluid Pressure Gauge on the line pressure tap and appropriate clutch pressure tap can be switched to confirm that Transmission Fluid Pressure Gauges calibration differences are not the cause.
  4. If the difference is greater than 103 kPa (15 psi), there is a leak in the corresponding clutch pressure circuit. The Transmission Fluid Pressure Gauges on the line pressure tap and clutch pressure tap can be switched to confirm that Transmission Fluid Pressure Gauges calibration differences are not the cause. Carry out the appropriate procedure to correct the clutch leak problem.
  5. When the pressure tests are completed, install the pressure tap plugs.
    - Tighten to 12 Nm (106 lb-in).
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**Leakage Inspection**

## Special Tool(s)

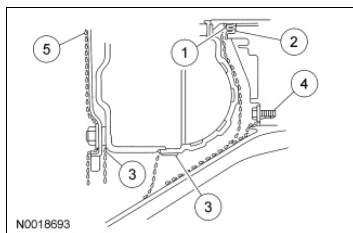
	Leak Tester, Torque Converter 307-421
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## Material

Item	Specification
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	-

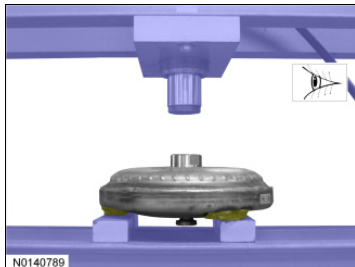
**NOTE:** When diagnosing transmission leaks, the source of the leak must be positively identified prior to repair. If the vehicle is driven extensively between adding the fluorescent additive and performing the leak test, the leaking oil can spread and make identifying the location of the leak difficult.

1. Clean off any transmission fluid from the top and bottom of the torque converter housing, the front of the case and rear face of the engine and oil pan. Clean the torque converter area by washing with a nonflammable solvent and blow dry with compressed air.
2. Add Dye-Lite® ATF Power Steering Fluid Leak Detection Dye to the transmission fluid. Use one 30 ml (1 fl. oz) of dye solution for every 3.8 L (4 qt) of transmission fluid.
3. Start and run the engine until the transmission reaches its normal operating temperature. Raise the vehicle on a hoist and run the engine occasionally shifting to the DRIVE and REVERSE ranges to increase pressure within the transmission. Using a black light, observe the back of the cylinder block and top of the torque converter housing for evidence of fluid leakage. Run the engine until transmission fluid leakage is evident and the probable source of leakage can be determined.

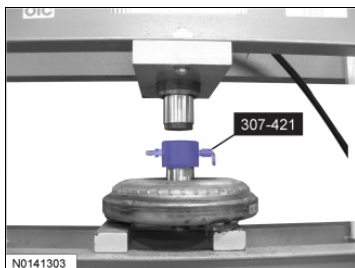


4. If the source of the leak is obvious, repair as required. Leaks from the torque converter housing can originate from several locations. The paths which the fluid takes to reach the bottom of the torque converter housing are shown in the illustration. The 5 steps following correspond with the numbers in the illustration.
  1. Transmission fluid leaking by the converter hub seal lip will tend to move along the drive hub and onto the back of the torque converter. Except in the case of a total seal failure, transmission fluid leakage by the lip of the seal will be deposited on the inside of the torque converter housing only, near the outside diameter of the housing.

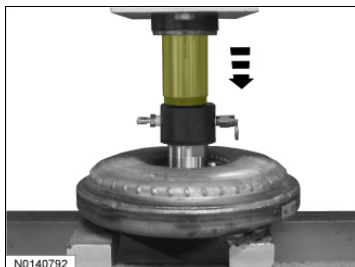
2. Transmission fluid leakage by the outside diameter of the converter impeller hub seal and the case will follow the same path that leaks by the ID of the converter hub seal follow.
  3. Transmission fluid leakage from the converter cover weld or the converter-to-flexplate stud weld will appear at outside diameter of torque converter on the back face of the flexplate and in the converter housing only near the flexplate. If a converter-to-flexplate lug, lug weld or converter cover weld leak is suspected, remove the converter and pressure check.
  4. Transmission fluid leakage from the bolts inside the converter housing will flow down the back of the torque converter housing. Leakage may be from loose or missing bolts.
  5. Engine oil leaks from the rear main oil.
5. Remove the torque converter.
  6. Using a black light, observe the torque converter housing. Inspect for evidence of dye from the pump bolts, pump seal, and torque converter hub seal. Repair as required.
  7. If the source of the leak is not evident, continue with this procedure to leak test the torque converter.
  8. Install the torque converter in the arbor press. Support the torque converter on the mounting pads.



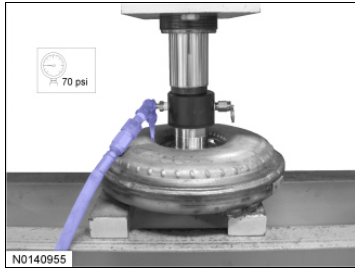
9. Install the Leak Tester, Torque Converter 307-421 into the torque converter hub.



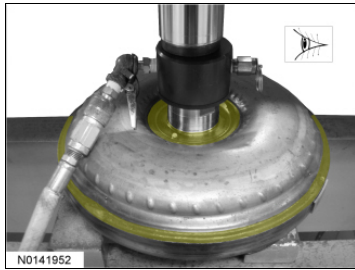
10. Secure the press. Only apply enough force from the press to seal of the Leak Tester, Torque Converter 307-421 into the torque converter hub.



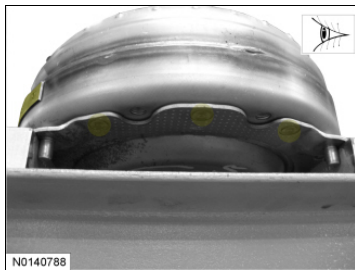
11. Connect a compressed air supply to the Leak Tester, Torque Converter 307-421.



12. With air pressure applied to the valve, inspect for leaks at the converter hub weld and seams. A soap bubble solution can be applied around those areas to aid in the diagnosis. If any leaks are present, install a new torque converter.



13. With air pressure applied to the valve, inspect for leaks at the stud or mounting pad and balance weight welds. A soap bubble solution can be applied around those areas to aid in the diagnosis. If any leaks are present, install a new torque converter.



14. After leaks are repaired, clean remaining transmission fluid dye from serviced areas.
-



## Transmission Fluid Cooler

**NOTICE:** Whenever a transmission has been disassembled to install new parts, the transmission fluid cooler lines must be cleaned and backflushed. Refer to Transmission Fluid Cooler Tubes Backflushing and Cleaning in this section. A new transmission fluid cooler must be installed.


**NOTE:** Cleaning and backflushing the transmission fluid cooling system along with following all the normal cleaning and inspection procedures in this section during disassembly and reassembly will keep contamination from re-entering the transmission and causing a repeat repair.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material or band material may have been carried into the torque converter and transmission fluid cooler. These contaminants are a major cause of recurring transmission troubles and must be removed from the system before the transmission is put back into use. For new transmission fluid cooler which is part of the A/C condenser and can not be serviced separately, refer to Section 412-01 . For transmission fluid cooler tube installation, refer to Section 307-02 .

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**Diagnosis By Symptom****Special Tool(s)**

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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The Diagnosis by Symptom routines give the technician diagnostic information, direction and suggest possible components, using a symptom as a starting point.

The Diagnosis by Symptom routines are divided into 2 categories: Electrical Routines, indicated by 200 series numbers, and Hydraulic/Mechanical Routines, indicated by 300 series numbers. The Electrical Routines list the possible electrical components that could cause or contribute to the symptom described. The Hydraulic/Mechanical Routines list the possible hydraulic or mechanical components that could cause or contribute to the symptom described.

**Diagnosis by Symptom Index Directions**

1. Using the Diagnosis by Symptom Index, select the Concern/Symptom that best describes the condition.
2. Refer to the routine indicated in the Diagnosis by Symptom Index.
3. Always begin diagnosis of a symptom with:
  - a. preliminary inspections.
  - b. verifications of condition.
  - c. checking the fluid levels.
  - d. carrying out other test procedures as directed.
4. **NOTE:** Not all concerns and conditions with electrical components will set a DTC. Be aware that the components listed may still be the cause. Verify correct function of these components prior to proceeding to the Hydraulic/Mechanical Routine listed.  
  
Begin with the Electrical Routine, if indicated. Follow the reference or action required statements. Always carry out the On-Board Diagnostic (OBD) tests as required. Never skip steps. Repair as required. If the concern is still present after electrical diagnosis, then proceed to the Hydraulic/Mechanical Routine listed.
5. The Hydraulic/Mechanical Routines list possible hydraulic or mechanical components that could cause the concern. These components are listed in the removal sequence and by most probable cause. All components listed must be inspected to ensure correct repair.

**Diagnosis by Symptom Index**

Title	Routines	
	Electrical <sup>a</sup>	Hydraulic/ Mechanical
<b>Engagement Concerns</b>		
No Forward	201	301
No Reverse	202	302
Harsh Reverse	203	303
Harsh Forward	204	304
Delayed/Soft Reverse	205	305
Delayed/Soft Forward	206	306
No Forward and No Reverse	207	307
<b>Shift Concerns</b>		
Some/All Shifts Missing	210	310
Timing Concerns		
- Early/Late	211	311
- Erratic/Hunting	212	312
Feel		
- Soft/Slipping	213	313
- Harsh	214	314
No 1st Gear, Engages in Higher Gear	215	315
No Manual 1st Gear	216	316
No Manual 2nd Gear	217	317
1-2 Shift (Automatic)	220	320
2-3 Shift (Automatic)	221	321
3-4 Shift (Automatic)	222	322
4-3 Shift (Automatic)	223	323
3-2 Shift (Automatic)	224	324
2-1 Shift (Automatic)	225	325
<b>Torque Converter Operation Concerns</b>		
No Apply	240	340
Always Applied/Stalls Vehicle	241	341
Cycling/Shudder/Chatter	242	342
<b>Other Concerns</b>		
No Engine Braking in Manual 2nd or Manual 1st Position	250	350
Selector Lever Efforts High	251	351
External Leaks	252	352
Vehicle Driveability Concerns	253	353
Noise/Vibration in Forward or Reverse	254	354
Engine Will Not Crank	255	355
No park (P) Range	256	356
Overheating	257	357

<sup>a</sup> Carry out electrical routine first.**Diagnostic Routines**

**Engagement Concern: No Forward**

Possible Component	Reference/Action
<b>201 - ELECTRICAL ROUTINE</b>	
<ul style="list-style-type: none"> <li>No electrical concerns</li> </ul>	
<b>301 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
<ul style="list-style-type: none"> <li>Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>Condition</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Selector Lever Linkage</b>	
<ul style="list-style-type: none"> <li>Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u>. Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>Low forward clutch pressure, low line pressure</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low, check the following components: transmission fluid filter and seal assembly, main controls, pump assembly, forward clutch assembly.</li> </ul>
<b>Transmission Fluid Filter and Seal Assembly</b>	
<ul style="list-style-type: none"> <li>Plugged, damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>3-4 shift valve, main regulator valve, manual valve - stuck, damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect gaskets for damage and install a new gasket.</li> </ul>



• 2-3 accumulator and seals damaged	• Inspect piston, seals and bore for damage. Repair as required.
• Pressure regulator valve	• Inspect the diameter for wear.
<b>Pump Assembly</b>	
• Bolts not tightened to specifications	• Tighten bolts to specifications.
• Porosity/cross leaks/ball missing or leaking, plugged hole	• Inspect for porosity and leaks. Repair as required.
• No. 3 and No. 4 seal rings damaged	• Inspect seals for damage. Repair as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
<b>Forward Clutch Assembly</b>	
• Seals, piston damaged	• Inspect seals for damage. Repair as required.
• Check balls damaged, missing, mislocated, not seating correctly	• Inspect for mislocation, poor seating, damage. Install a new cylinder as required.
• Friction elements damaged or worn	• Check for abnormal wear, damage. Repair as required.
<b>One-Way Clutch (OWC) Assembly (Planetary)</b>	
• Worn, damaged or assembled incorrectly	• Inspect for damage. Repair as required.
<b>Output Shaft</b>	

• Damaged	• Inspect for damage. Install new components as required.
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**Engagement Concern: No Reverse**

Possible Component		Reference/Action
<b>202 - ELECTRICAL ROUTINE</b>		
	• No electrical concerns	
<b>302 - HYDRAULIC/MECHANICAL ROUTINE</b>		
<b>Transmission Fluid</b>		
	• Incorrect level	• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.
	• Condition	• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.
<b>Selector Lever Linkage</b>		
	• Damaged or incorrectly adjusted	• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.
<b>Incorrect Pressures</b>		
	• Low reverse clutch pressure, low reverse band pressure, low line pressure	• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low, check the following components: transmission fluid oil filter and seal assembly, main controls, reverse servo, pump assembly, reverse clutch assembly.
<b>Transmission Fluid Filter and Seal Assembly</b>		
	• Plugged, damaged	• Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.
<b>Main Controls</b>		
	• No. 6 shuttle ball, manual valve, main regulator valve, 1-2 accumulator seals stuck or damaged	• Inspect for damage. Repair as required.

	• Loose bolts	• Tighten bolts to specifications.
	• Gasket damaged	• Inspect for damage and install a new gasket.
<b>Low/Reverse Servo</b>		
	• Seals (piston and cover) damaged	• Inspect for damage. Repair as required.
	• Servo cover retaining ring damaged	
	• Anchor pins (case) damaged	
<b>Pump Assembly</b>		
	• Loose bolts	• Tighten bolts to specifications.
	• Porosity/cross leaks/ball missing or leaking, plugged hole	• Inspect pump assembly. Install new as required.
	• Gasket damaged	• Inspect for damage and install a new gasket.
	• No. 1 and 2 seal rings damaged	• Inspect for damage. Repair as required.
<b>Reverse Clutch Assembly</b>		
	• Seals, piston damaged	• Inspect for damage. Repair as required.
	• Check ball missing or damaged	
	• Friction elements damaged or worn	
<b>Low/Reverse Band</b>		
	• Band, servo, anchor pins damaged or worn	• Inspect for damage. Repair as required.

### Engagement Concern: Harsh Reverse

Possible Component	Reference/Action
<b>203 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
• Electrical inputs/outputs,	• Carry out self-test; refer to the Powertrain

vehicle wiring harnesses, transmission internal wiring harness, PCM, Transmission Fluid Temperature (TFT) sensor, Electronic Pressure Control (EPC) solenoid	Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. Carry out engagement test, EPC test and <u>GO to Pinpoint Test B</u> or <u>GO to Pinpoint Test D</u> . Check idle speed. Repair as required. Clear the DTCs, road test and repeat self-test.
<b>303 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
<ul style="list-style-type: none"> <li>• Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>• Condition</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Engine Driveline</b>	
<ul style="list-style-type: none"> <li>• Looseness in the driveshaft, U-joints or the engine mounts</li> </ul>	<ul style="list-style-type: none"> <li>• Repair as required.</li> </ul>
<b>Selector Lever Linkage</b>	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u>. Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>• High line pressure, high EPC pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If high, check the following components: main controls, transmission fluid oil filter and seal assembly.</li> </ul>
<b>Transmission Fluid Filter and Seal Assembly</b>	
<ul style="list-style-type: none"> <li>• Plugged, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• No. 6 shuttle ball, No. 5 check ball, manual valve, main regulator valve stuck, damaged or missing</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>

• Gasket damaged	• Inspect for damage and install a new gasket.
• EPC solenoid stuck or damaged	• Inspect for damage, contamination. Carry out EPC test in Routine No. 203. Repair as required.
<b>Low Reverse Servo</b>	
• Seals (piston and cover) damaged	• Inspect for damage. Repair as required.
• Servo cover retaining ring assembled incorrectly	
• Anchor pins (case) damaged	
<b>Pump Assembly</b>	
• Bolts not tightened to specifications	• Tighten bolts to specifications.
• Porosity/cross leaks	• Inspect pump assembly. Install new as required.
• Gasket damaged	• Inspect for damage and install a new gasket.
• No. 1 and No. 2 seal rings damaged	• Inspect for damage. Repair as required.
<b>Reverse Clutch Assembly</b>	
• Seals, piston damaged	• Inspect for damage. Repair as required.
• Check ball missing or damaged	
• Friction elements damaged, worn	
• Return spring piston damaged, worn	
<b>Low Reverse Band</b>	
• Band, servo, anchor pin damaged or worn	• Inspect for damage. Repair as required.

### Engagement Concern: Harsh Forward

Possible Component	Reference/Action
<b>204 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	

<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, Transmission Fluid Temperature (TFT) sensor, Electronic Pressure Control (EPC) solenoid</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test; refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. Carry out engagement test and EPC test. <u>GO to Pinpoint Test B</u> or <u>GO to Pinpoint Test D</u>. Check idle speed. Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>304 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
<ul style="list-style-type: none"> <li>• Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>• Condition</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Engine Driveline</b>	
<ul style="list-style-type: none"> <li>• Looseness in the driveshaft, U-joints or the engine mounts</li> </ul>	<ul style="list-style-type: none"> <li>• Repair as required.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>• High forward clutch pressure, high line pressure, high EPC pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are high, check the following possible components: main controls, pump assembly.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• Main regulator valve stuck, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<ul style="list-style-type: none"> <li>• EPC solenoid stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage or contamination. Carry out EPC test in Routine 204. Repair as required.</li> </ul>
<b>Case</b>	
<ul style="list-style-type: none"> <li>• 2-3 accumulator seal/retainer stuck, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Pump Assembly</b>	
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>• Porosity/cross leaks</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for porosity/leaks. Install a new pump as required.</li> </ul>

• Gaskets damaged	• Inspect for damage and install a new gasket.
<b>Forward Clutch Assembly</b>	
• Check balls missing or damaged	• Inspect for mislocation, poor seating, damage. Install a new forward clutch cylinder.
• Friction element damaged or worn	• Inspect for damage. Repair as required.
• Forward clutch wave spring damaged	• Inspect for damage. Repair as required.
• Forward clutch return spring damaged	• Inspect for damage. Repair as required.

**Engagement Concern: Delayed/Soft Reverse**

Possible Component	Reference/Action
<b>205 - ELECTRICAL ROUTINE</b>	
• No electrical concerns	
<b>305 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
• Incorrect level	• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.
• Condition	• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.
<b>Selector Lever Linkage</b>	
• Damaged or incorrectly adjusted	• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.
<b>Incorrect Pressures</b>	
• Low reverse clutch pressure, low reverse band pressure, low line pressure	• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low, check the following components: main controls, pump assembly, reverse clutch assembly, reverse servo.

<b>Transmission Fluid Filter and Seal Assembly</b>		
	<ul style="list-style-type: none"> <li>• Plugged, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.</li> </ul>
<b>Main Controls</b>		
	<ul style="list-style-type: none"> <li>• No. 6 shuttle ball, manual valve, main regulator valve stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Case</b>		
	<ul style="list-style-type: none"> <li>• 1-2 accumulator seals stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Low Reverse Servo</b>		
	<ul style="list-style-type: none"> <li>• Seals (piston and cover) damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Servo cover retaining ring assembled incorrectly</li> </ul>	
<b>Pump Assembly</b>		
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specification</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specification.</li> </ul>
	<ul style="list-style-type: none"> <li>• Porosity/cross leaks/ball missing or leaking</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect pump assembly. Install new as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
		<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>



	<ul style="list-style-type: none"> <li>• No. 1 and No. 2 seal rings damaged</li> </ul>	
<b>Reverse Clutch Assembly</b>		
	<ul style="list-style-type: none"> <li>• Seals, piston damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Install new components as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Check ball missing or damaged</li> </ul>	
	<ul style="list-style-type: none"> <li>• Friction elements damaged, worn</li> </ul>	
	<ul style="list-style-type: none"> <li>• Return spring and piston damaged, worn</li> </ul>	
<b>Low Reverse Band</b>		
	<ul style="list-style-type: none"> <li>• Damaged, worn</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>

**Engagement Concern: Delayed/Soft Forward**

Possible Component	Reference/Action
<b>206 - ELECTRICAL ROUTINE</b>	
<ul style="list-style-type: none"> <li>• No electrical concerns</li> </ul>	
<b>306 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
<ul style="list-style-type: none"> <li>• Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>• Condition</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Selector Lever Linkage</b>	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR)</u></li> </ul>

	<u>Sensor Adjustment</u> in this section.
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>• Low forward clutch pressure, low line pressure, low Electronic Pressure Control (EPC) pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low, check the following components: transmission fluid filter and seal assembly, main controls and pump assembly.</li> </ul>
<b>Transmission Fluid Filter and Seal Assembly</b>	
<ul style="list-style-type: none"> <li>• Plugged, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• 3-4 shift valve, main regulator valve stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and repair as required.</li> </ul>
<b>Case</b>	
<ul style="list-style-type: none"> <li>• 2-3 or 1-2 accumulator, bore damaged or stuck</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Pump Assembly</b>	
<ul style="list-style-type: none"> <li>• Bolts not tightened to specification</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>• Porosity/cross leaks</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect pump assembly. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• No. 3 and No. 4 seal rings damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Forward Clutch Assembly</b>	
<ul style="list-style-type: none"> <li>• Seals, piston damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Check balls missing, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for mislocation, poor seating, damage. Install a new cylinder as required.</li> </ul>

• Friction elements damaged, worn	• Check for damage. Repair as required.
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**Engagement Concern: No Forward and No Reverse**

Possible Component	Reference/Action
<b>207 - ELECTRICAL ROUTINE</b>	
• No electrical concerns	
<b>307 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
• Incorrect level	• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.
• Condition	• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.
<b>Selector Lever Linkage</b>	
• Damaged or incorrectly adjusted	• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust the transmission selector lever cable as necessary. After repairing the transmission selector lever cable, verify the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary. Refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.
<b>Incorrect Pressures</b>	
• Low pressure	• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low, check the following components: transmission fluid filter and seal assembly, main controls, pump assembly and forward clutch assembly.
<b>Transmission Fluid Filter and Seal Assembly</b>	
• Plugged, damaged	• Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.
<b>Main Controls</b>	
• Main regulator valve, manual valve - stuck, damaged or missing	• Inspect for damage. Repair as required.
	• Tighten bolts to specifications.

	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect gaskets for damage and install a new gasket.</li> </ul>
<b>Pump Assembly</b>		
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
	<ul style="list-style-type: none"> <li>• Porosity/cross leaks/ball missing or leaking</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect pump assembly. Install new as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• No. 1 and No. 2 seal rings damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect seals for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Output Shaft</b>		
	<ul style="list-style-type: none"> <li>• Shaft damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Install new as required.</li> </ul>
<b>Torque Converter</b>		
	<ul style="list-style-type: none"> <li>• Flexplate, adapter plate, turbine hub or impeller hub damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Remove the transmission. Inspect for damage. Refer to <u>Torque Converter Contamination Inspection</u> in this section. If the torque converter fails to pass the criteria for replacement or is damaged, install a new or remanufactured torque converter.</li> </ul>

**Shift Concerns: Some/All Shifts Missing**

Possible Component	Reference/Action
<b>210 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test; refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> , <u>GO to Pinpoint Test C</u> or <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>310 - HYDRAULIC/MECHANICAL ROUTINE</b>	

Transmission Fluid	
<ul style="list-style-type: none"> <li>• Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>• Condition</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
Selector Lever Linkage, TR Sensor	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
	<ul style="list-style-type: none"> <li>• Refer to the following shift routine(s) for further diagnosis: <ul style="list-style-type: none"> <li>◆ Shift 1-2, Routine 220/320</li> <li>◆ Shift 2-3, Routine 221/321</li> <li>◆ Shift 3-4, Routine 222/322</li> <li>◆ Shift 4-3, Routine 223/323</li> <li>◆ Shift 3-2, Routine 224/324</li> <li>◆ Shift 2-1, Routine 225/325</li> </ul> </li> </ul>

**Shift Concerns: Timing Concerns - Early/Late**

Possible Component	Reference/Action
<b>211 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Electronic Pressure Control (EPC) solenoid, Transmission Fluid Temperature (TFT) sensor, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> , <u>GO to Pinpoint Test C</u> or <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>311 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Other</b>	
<ul style="list-style-type: none"> <li>• Tire size change, axle ratio change</li> </ul>	<ul style="list-style-type: none"> <li>• Verify vehicle has original equipment. Refer to Certification Label and Safety Standard Certification Label. Changes in tire size or axle ratio will affect shift timing.</li> </ul>
<b>Transmission Fluid</b>	

• Incorrect level	• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.
• Condition	• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.
<b>Powertrain Control System</b>	
• Engine driveability concerns	• Refer to Routine 253.
<b>Incorrect Pressures</b>	
• Line pressure, Electronic Pressure Control (EPC) pressure	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If not OK, check the main controls. If OK, refer to the shift routine(s) for further diagnosis:</li> <li>◆ Shift 1-2, Routine 320</li> <li>◆ Shift 2-3, Routine 321</li> <li>◆ Shift 3-4, Routine 322</li> <li>◆ Shift 4-3, Routine 323</li> <li>◆ Shift 3-2, Routine 324</li> <li>◆ Shift 2-1, Routine 325</li> </ul>
<b>Main Controls</b>	
• EPC solenoid, stuck or damaged hydraulically or mechanically	• Inspect for damage, contamination. Carry out EPC tests in Routine No. 211. Repair as required.
• Valves, accumulators, seals stuck or damaged or assembled incorrectly	• Inspect for damage. Repair as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
• Solenoid screen blocked or damaged	• Clean or install a new screen.

**Shift Concerns: Timing Concerns - Erratic/Hunting**

Possible Component		Reference/Action
<b>212 - ELECTRICAL ROUTINE</b>		
<b>Powertrain Control System</b>		
	<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Torque Converter Clutch (TCC) solenoid, Transmission Range (TR) sensor, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis. <u>GO to Pinpoint Test A</u> , <u>GO to Pinpoint Test C</u> or <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>

	• Poor engine performance	• Refer to Routine 253.
<b>312 - HYDRAULIC/MECHANICAL ROUTINE</b>		
<b>Transmission Fluid</b>		
	• Incorrect level	• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.
	• Condition	• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.
<b>Main Controls</b>		
	• Valves, accumulators, seals, assembled wrong, stuck or damaged	• Inspect for damage. Repair as required.
	• Gaskets damaged	• Inspect for damage and install a new gasket.
	• Solenoid screen blocked or damaged	• Clean or install a new screen.
<b>Torque Converter Clutch (TCC)</b>		
	• Torque converter	• Refer to Torque Converter Operation Concerns: Cycling/Shudder/Chatter Hydraulic/Mechanical Routine 342.
<b>Specific Shifts</b>		
		<ul style="list-style-type: none"> <li>• Refer to the following shift routine(s) for further diagnosis: <ul style="list-style-type: none"> <li>◆ Shift 1-2, Routine 320</li> <li>◆ Shift 2-3, Routine 321</li> <li>◆ Shift 3-4, Routine 322</li> <li>◆ Shift 4-3, Routine 323</li> <li>◆ Shift 3-2, Routine 324</li> <li>◆ Shift 2-1, Routine 325</li> </ul> </li> </ul>

**Shift Concerns: Feel - Soft/Slipping**

Possible Component	Reference/Action
<b>213 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	

	<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, Electronic Pressure Control (EPC) solenoid, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test D</u> or <u>GO to Pinpoint Test E</u>. Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
	<ul style="list-style-type: none"> <li>• Engine driveability concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to Routine 253.</li> </ul>
<b>313 - HYDRAULIC/MECHANICAL ROUTINE</b>		
<b>Transmission Fluid</b>		
	<ul style="list-style-type: none"> <li>• Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
	<ul style="list-style-type: none"> <li>• Condition</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>		
	<ul style="list-style-type: none"> <li>• Low line pressure, low EPC pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low or all shifts are soft/slipping, go to main controls. If pressures are OK and a specific shift is soft/slipping, refer to the following routine(s) for further diagnosis: <ul style="list-style-type: none"> <li>◆ Shift 1-2, Routine 320</li> <li>◆ Shift 2-3, Routine 321</li> <li>◆ Shift 3-4, Routine 322</li> <li>◆ Shift 4-3, Routine 323</li> <li>◆ Shift 3-2, Routine 324</li> <li>◆ Shift 2-1, Routine 325</li> </ul> </li> </ul>
<b>Main Controls</b>		
	<ul style="list-style-type: none"> <li>• Main regulator valve, overdrive servo regulator valve stuck, damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• EPC solenoid stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and contamination. Carry out EPC tests in Routine 213. Repair as required.</li> </ul>
<b>Case</b>		
	<ul style="list-style-type: none"> <li>• 1-2 accumulator stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Transmission Fluid Filter and Seal Assembly</b>		
	<ul style="list-style-type: none"> <li>• Plugged, damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage, install a new transmission fluid filter and seal assembly</li> </ul>



		as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.
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**Shift Concerns: Feel - Harsh**

Possible Component		Reference/Action
<b>214 - ELECTRICAL ROUTINE</b>		
<b>Powertrain Control System</b>		
	<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, Electronic Pressure Control (EPC) solenoid, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test D</u> or <u>GO to Pinpoint Test E</u>. Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
	<ul style="list-style-type: none"> <li>Engine driveability concerns</li> </ul>	<ul style="list-style-type: none"> <li>Refer to Routine 253.</li> </ul>
<b>314 - HYDRAULIC/MECHANICAL ROUTINE</b>		
<b>Transmission Fluid</b>		
	<ul style="list-style-type: none"> <li>Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
	<ul style="list-style-type: none"> <li>Condition</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>		
	<ul style="list-style-type: none"> <li>High line pressure, high EPC pressure</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are high or all shifts are harsh, go to Main Controls. If pressures are OK and a specific shift is harsh, refer to the following shift routine(s) for further diagnosis: <ul style="list-style-type: none"> <li>◆ Shift 1-2, Routine 320</li> <li>◆ Shift 2-3, Routine 321</li> <li>◆ Shift 3-4, Routine 322</li> <li>◆ Shift 4-3, Routine 323</li> <li>◆ Shift 3-2, Routine 324</li> <li>◆ Shift 2-1, Routine 325</li> </ul> </li> </ul>
<b>Main Controls</b>		
	<ul style="list-style-type: none"> <li>Main regulator valve, Overdrive (O/D) servo regulator valve stuck, damaged or</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>

	assembled incorrectly	
	<ul style="list-style-type: none"> <li>• EPC solenoid stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage or contamination. Carry out EPC tests in Routine 214. Repair as required.</li> </ul>

### Shift Concerns: No 1st Gear, Engages In Higher Gear

Possible Component	Reference/Action
<b>215 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Transmission Range (TR) sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> or <u>GO to Pinpoint Test C</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>315 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, TR Sensor</b>	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment. Refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>• Low reverse clutch pressure, low reverse band pressure, low line pressure</li> <li>• Forward Off, Intermediate Off, Direct X</li> <li>• Forward Off, Intermediate X, Direct Off</li> <li>• Forward Off, Intermediate X, Direct X</li> <li>• Forward X, Intermediate Off, Direct X</li> <li>• Forward X, Intermediate X, Direct Off</li> <li>• Forward X, Intermediate X, Direct X</li> <li>• Forward X, Intermediate Off, Direct Off</li> </ul>	<ul style="list-style-type: none"> <li>• Check for which pressures are on and refer to Band and Clutch Application Chart A + B and corresponding routines.</li> <li>◆ 324, 301</li> <li>◆ 325, 301</li> <li>◆ 323, 324, 325, 301</li> <li>◆ 324</li> <li>◆ 325</li> <li>◆ 323, 324, 325</li> <li>◆ Refer to appropriate mechanical diagnosis.</li> </ul>
<b>Mechanical</b>	

• Bands, clutches or seals damaged or worn	• Refer to Transmission Disassembly and Assembly.
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X = pressure applied

**Shift Concerns: No Manual 1st Gear**

Possible Component	Reference/Action
<b>216 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Transmission Range (TR) sensor</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> or <u>GO to Pinpoint Test C</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>316 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, Cable, TR Sensor</b>	
<ul style="list-style-type: none"> <li>Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>Low reverse clutch pressure, low reverse band pressure, low line pressure, low Electronic Pressure Control (EPC) pressure</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressures are low, check the following components: transmission fluid filter and seal assembly, main controls, reverse clutch assembly and reverse servo assembly.</li> </ul>
<b>Transmission Fluid Filter and Seal Assembly</b>	
<ul style="list-style-type: none"> <li>Plugged, damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage, install a new transmission fluid filter and seal assembly as required. Refer to <u>Fluid Pan, Gasket and Filter</u> in this section.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>No. 6 shuttle ball, manual valve, main regulator valve, low servo modulator valve stuck, damaged or assembled</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>

	incorrectly	
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Low Reverse Servo</b>		
	<ul style="list-style-type: none"> <li>• Seals (piston and cover) damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
		<ul style="list-style-type: none"> <li>• Servo cover retaining ring assembled incorrectly.</li> </ul>
		<ul style="list-style-type: none"> <li>• Anchor pins (case) damaged.</li> </ul>

**Shift Concerns: No Manual 2nd Gear**

Possible Component	Reference/Action
<b>217 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Transmission Range (TR) sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> or <u>GO to Pinpoint Test C</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>317 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, Cable, TR Sensor</b>	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• 3-4 shift valve, 1-2 and 2-3 shift valve, 3-4 capacity modulator valve stuck, damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>

• Gaskets damaged	• Inspect for damage and install a new gasket.
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**Shift Concerns: 1-2 Shift (Automatic)**

Possible Component	Reference/Action
<b>220 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> or <u>GO to Pinpoint Test E</u>. Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<ul style="list-style-type: none"> <li>Poor engine performance</li> </ul>	<ul style="list-style-type: none"> <li>Refer to Routine 253.</li> </ul>
<b>320 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, Transmission Range (TR) Sensor</b>	
<ul style="list-style-type: none"> <li>Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u>. Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>Intermediate clutch pressure, line pressure</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If not OK, check the main controls.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>1-2 shift valve, stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>Tighten bolts to specification.</li> </ul>
<ul style="list-style-type: none"> <li>Shift Solenoid A (SSA) malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Gasket damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage and install a new gasket.</li> </ul>
<ul style="list-style-type: none"> <li>No. 8 ball not seating</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<b>Case</b>	

	<ul style="list-style-type: none"> <li>• 1-2 accumulator stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Pump</b>		
	<ul style="list-style-type: none"> <li>• Porosity/cross leaks, balls missing, damaged or leaking</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for porosity/leaks, balls missing. Install a new pump as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gasket damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Intermediate Clutch Assembly</b>		
	<ul style="list-style-type: none"> <li>• Seals damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Piston damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Friction elements damaged or worn</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Intermediate One-Way Clutch (OWC) Assembly</b>		
	<ul style="list-style-type: none"> <li>• Not holding or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Planetary OWC Assembly</b>		
	<ul style="list-style-type: none"> <li>• Not overrunning or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>1-2 Accumulator</b>		
	<ul style="list-style-type: none"> <li>• Damaged accumulator piston</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Springs damaged or broken</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Case bore scored</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>

### Shift Concerns: 2-3 Shift (Automatic)

Possible Component	Reference/Action
<b>221 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, One-Way Clutch (OWC)</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> or <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>

• Engine driveability concerns	• Refer to Routine 253.
<b>321 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage</b>	
• Damaged or incorrectly adjusted	• Inspect and repair as required. Verify transmission selector lever cable adjustment. Refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.
<b>Incorrect Pressures</b>	
• Direct clutch pressure	• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If not OK, check the main controls.
<b>Main Controls</b>	
• 2-3 shift valve, check ball No. 9 or No. 3, solenoid pressure regulator valve, damaged or assembled incorrectly	• Inspect for damage. Repair as required.
• Bolts not tightened to specifications	• Tighten bolts to specifications.
• Shift Solenoid B (SSB) malfunction	• Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
• Output shaft seals damaged or cup plug leaking or missing	• Inspect for damage and repair as required.
• 2-3 accumulator damaged or stuck	• Inspect piston seal and bore for damage. Repair as required.
• Solenoid screen (in main control) blocked or damaged	• Clean or install a new screen.
<b>Intermediate OWC Assembly</b>	
• Not overrunning or damaged	• Inspect for damage. Repair as required.
<b>Output Shaft</b>	

• Seal rings damaged	• Inspect for damage. Repair as required.
• Cup plug damaged or missing	
<b>Direct Clutch Assembly</b>	
• Seals or piston damaged	• Inspect for damage. Repair as required.
• Friction elements worn or damaged	• Inspect for damage. Repair as required.
• Check ball not seating	• Inspect for damage. Repair as required.
• Return spring assembly damaged	• Inspect for damage. Repair as required.
<b>Case</b>	
• Output shaft rear seals leaking or damaged	• Inspect for damage. Repair as required. Inspect case for damaged seal area. If damaged, install a new case.
<b>2-3 Accumulator</b>	
• Damaged accumulator piston	• Inspect for damage. Repair as required.
• Springs damaged or broken	• Inspect for damage. Repair as required.
• Case bore scored	• Inspect for damage. Repair as required.

**Shift Concerns: 3-4 Shift (Automatic)**

Possible Component	Reference/Action
<b>222 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Output Shaft Speed (OSS), Transmission Control Switch (TCS)	• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> or <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.
• Engine driveability concerns	• Refer to Routine 253.
<b>322 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, Transmission Range (TR) Sensor</b>	



<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <a href="#">Section 307-05</a> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <a href="#">Transmission Range (TR) Sensor Adjustment</a> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>• Forward clutch pressure, direct clutch pressure, line pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <a href="#">Special Testing Procedures</a> in this section. If pressures are out of specification, check main controls.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• 3-4 shift valve, solenoid pressure regulator valve, Overdrive (O/D) servo regulator, 3-4 capacity modulator valve, 1-2 and 2-3 shift valves stuck, damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>• Shift Solenoid A (SSA) or Shift Solenoid B (SSB) malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<ul style="list-style-type: none"> <li>• O/D servo rod and piston cushion spring or seals damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Worn or damaged O/D servo anchor pins</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• No. 2, No. 4, No. 7 and No. 9 check balls damaged or missing</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Solenoid screen blocked or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Clean or install a new screen.</li> </ul>
<b>Pump</b>	
<ul style="list-style-type: none"> <li>• Porosity/cross leaks, balls missing, damaged or leaking</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for porosity/leaks, balls missing. Install a new pump as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Install new gaskets as required.</li> </ul>
<b>O/D Band</b>	

• O/D band and reverse clutch drum assembly damaged, worn or assembled incorrectly	• Inspect for damage. Repair as required.
• Intermediate One-Way Clutch (OWC) assembly damaged	• Inspect for damage. Repair as required.
<b>Forward Clutch Assembly</b>	
• Seals or piston damaged	• Inspect for damage. Repair as required.
• Friction elements worn or damaged	• Inspect for damage. Repair as required.
• Check ball stuck, damaged or not seating correctly	• Inspect for damage. Repair as required.
<b>Input Shaft</b>	
• Seals damaged	• Inspect for damage. Repair as required.

#### Shift Concerns: 4-3 Shift (Automatic)

Possible Component	Reference/Action
<b>223 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids, Transmission Control Switch (TCS)	• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> . Repair as required. Clear the DTCs, road test and repeat self-test.
<b>323 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Incorrect Pressures</b>	
• Forward clutch pressure, line pressure	• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If out of specification, check the main controls.
<b>Main Controls</b>	
• 3-4 shift valve, solenoid pressure regulator valve, Overdrive (O/D) servo regulator, 3-4 capacity modulator, 1-2 and 2-3 shift valves stuck, damaged or assembled incorrectly	• Inspect for damage. Repair as required.
• Check balls No. 2, No. 7, No. 9 damaged, missing or not seating	• Inspect for damage. Repair as required.

correctly	
• Bolts not tightened to specifications	• Tighten bolts to specification.
• Shift Solenoid A (SSA) malfunction	• Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
• O/D servo, seal, rod damaged	• Inspect for damage. Repair as required.
• Solenoid screen blocked or damaged	• Clean or install a new screen.
<b>Pump</b>	
• Porosity/cross leaks, balls missing, damaged or leaking	• Inspect for porosity/leaks, balls missing. Install a new pump as required.
• Seal rings damaged	• Inspect for damage. Repair as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
<b>O/D Band</b>	
• O/D band and reverse clutch assembly damaged, worn or assembled incorrectly	• Inspect for damage. Repair as required.
• Intermediate One-Way Clutch (OWC) assembly damaged	• Inspect for damage. Repair as required.
<b>Forward Clutch Assembly</b>	
• Seals or piston damaged	• Inspect for damage. Repair as required.
• Friction elements damaged, worn	• Inspect for damage. Repair as required.
• Check ball stuck, damaged or not seating correctly	• Inspect for damage. Repair as required.
• Forward clutch piston and return spring damaged	• Inspect for damage. Repair as required.
<b>Input Shaft</b>	
• Seals damaged	• Inspect for damage. Repair as required.

### Shift Concerns: 3-2 Shift (Automatic)

Possible Component	Reference/Action
<b>224 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>324 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>Direct clutch</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If not within specification, check the main controls.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>2-3 shift valve stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Check balls damaged or missing</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>Shift Solenoid B (SSB) malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage and install a new gasket.</li> </ul>
<b>Intermediate One-Way Clutch (OWC)</b>	
<ul style="list-style-type: none"> <li>Not holding or damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Intermediate OWC retaining snap ring not seated</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<b>Direct Clutch Assembly</b>	
<ul style="list-style-type: none"> <li>Seals or piston damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Friction element damaged, worn</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Check ball stuck, damaged or not seating correctly</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>

**Shift Concerns: 2-1 Shift (Automatic)**

Possible Component	Reference/Action
<b>225 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, shift solenoids</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>325 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>Intermediate clutch</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If not within specifications, check main controls and pump.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>1-2 shift valve, 1-2 accumulator solenoid pressure regulator valve stuck, damaged or assembled wrong</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>Tighten bolts to specifications.</li> </ul>
<ul style="list-style-type: none"> <li>Shift Solenoid A (SSA) malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Install new as required.</li> </ul>
<ul style="list-style-type: none"> <li>Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage and install a new gasket.</li> </ul>
<b>Pump</b>	
<ul style="list-style-type: none"> <li>Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage and install a new gasket.</li> </ul>
<ul style="list-style-type: none"> <li>Porosity/cross leaks</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for leak/porosity. Install a new pump as required.</li> </ul>
<b>Intermediate Clutch Assembly</b>	
<ul style="list-style-type: none"> <li>Piston damaged</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Friction elements damaged, worn</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>End clearance incorrect</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and correct; refer to Transmission Assembly.</li> </ul>
<b>Intermediate One-Way Clutch (OWC)</b>	

• Damaged	• Inspect for damage. Repair as required.
• Intermediate OWC retaining snap ring not seated	• Inspect for damage. Repair as required.
<b>Planetary OWC</b>	
• Not holding or damaged	• Inspect for damage. Repair as required.

**Torque Converter Clutch (TCC) Operation Concerns: No Apply**

Possible Component	Reference/Action
<b>240 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, Torque Converter Clutch (TCC) solenoid, Transmission Fluid Temperature (TFT) sensor, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test B</u> or <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<b>340 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage</b>	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Incorrect Pressures</b>	
<ul style="list-style-type: none"> <li>• Low line pressure, low Electronic Pressure Control (EPC) pressure</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Line Pressure Test. Refer to <u>Special Testing Procedures</u> in this section. If pressure is low, check EPC and main regulator valve. If within specifications, check the main controls.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• Solenoid pressure regulator valve, manual valve, bypass clutch control valve and plunger, converter pressure limit valve, drain back valve stuck, damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>

• Bolts not tightened to specifications	• Tighten bolts to specifications.
• Solenoid screen blocked or damaged	• Clean or install a new screen.
• TCC solenoid malfunction	• Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
<b>Torque Converter Assembly</b>	
• Leakage, friction material damaged, internal seals damaged	• Inspect torque converter. Repair or install a new or remanufactured torque converter as required.
<b>Pump Assembly</b>	
• Bolts not tightened to specifications	• Tighten bolts to specifications.
• Porosity/cross leaks, balls leaking	• Inspect for porosity/leaks, ball missing. Install a new pump as required.
• Gaskets damaged	• Inspect for damage and install a new gasket.
<b>Input Shaft</b>	
• Seals damaged	• Inspect for damage. Repair as necessary.

**Torque Converter Clutch (TCC) Operation Concerns: Always Applied/Stalls Vehicle**

Possible Component	Reference/Action
<b>241 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, Torque Converter Clutch (TCC) solenoid, Transmission Fluid Temperature (TFT) sensor	• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test B</u> or <u>GO to Pinpoint Test A</u> . Repair as required. Clear the DTCs, road test and repeat self-test.
<b>341 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Main Control</b>	
• Drain back valve, TCC and plunger stuck, damaged or assembled	• Inspect for damage. Repair as required.

	incorrectly	
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
	<ul style="list-style-type: none"> <li>• TCC solenoid malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• No. 7 ball incorrect seating</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Torque Converter Assembly</b>		
	<ul style="list-style-type: none"> <li>• No end clearance</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect converter and install a new or remanufactured torque converter as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Piston plate damaged or stuck to cover</li> </ul>	<ul style="list-style-type: none"> <li>• If cover is heat-stained, install a new converter and determine the cause of the overheat condition.</li> </ul>
<b>Pump Assembly</b>		
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
	<ul style="list-style-type: none"> <li>• Ball missing, leaking, porosity/cross leaks</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for porosity/leaks, balls missing. Install a new pump as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Input Shaft</b>		
	<ul style="list-style-type: none"> <li>• Seals damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>

**Torque Converter Clutch (TCC) Operation Concerns: Cycling/Shudder/Chatter**

Possible Component	Reference/Action
<b>242 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, PCM, Torque Converter Clutch (TCC) solenoid, Output Shaft Speed (OSS)</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test E</u> . Repair as required. Clear the DTCs, road test and repeat self-test.</li> </ul>
<ul style="list-style-type: none"> <li>• Speed control equipped vehicles</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate with speed control off.</li> </ul>
<b>342 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	



	<ul style="list-style-type: none"> <li>• Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>• Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
	<ul style="list-style-type: none"> <li>• Condition</li> </ul>	<ul style="list-style-type: none"> <li>• Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Main Controls</b>		
	<ul style="list-style-type: none"> <li>• Solenoid pressure regulator valve, No. 7 check ball, bypass clutch control valve and plunger, converter pressure limit valve stuck, damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>
	<ul style="list-style-type: none"> <li>• Solenoid screen blocked or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Clean or install a new screen.</li> </ul>
	<ul style="list-style-type: none"> <li>• TCC solenoid malfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Activate solenoid using scan tool. If solenoid operation cannot be felt when placing hand on solenoid, install a new solenoid. Inspect O-rings for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Torque Converter</b>		
	<ul style="list-style-type: none"> <li>• Excessive end clearance</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect converter. Install a new or remanufactured torque converter as required.</li> </ul>
<b>Pump Assembly</b>		
	<ul style="list-style-type: none"> <li>• Bolts not tightened to specification</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specification.</li> </ul>
	<ul style="list-style-type: none"> <li>• Porosity/cross leaks, missing balls or leaking</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for porosity/leaks or missing balls. Install a new pump as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Gaskets damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage and install a new gasket.</li> </ul>
<b>Input Shaft</b>		
	<ul style="list-style-type: none"> <li>• Seals damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>

**Other Concerns: No Engine Braking In Manual 2nd Or Manual 1st Position**

Possible Component	Reference/Action
<b>250 - ELECTRICAL ROUTINE</b>	
	<ul style="list-style-type: none"> <li>• No electrical concerns</li> </ul>

<b>350 - HYDRAULIC/MECHANICAL ROUTINE</b>		
<b>Selector Lever Linkage</b>		
	<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the Transmission Range (TR) sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Main Controls</b>		
	<ul style="list-style-type: none"> <li>• 3-4 shift valve, 1-2 and 2-3 shift valve, gaskets, 3-4 capacity modulator valve, stuck or damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Overdrive (O/D) servo assembly damaged or stuck in manual 2nd only.</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect cover, piston and seal for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• Low/Reverse servo assembly damaged or stuck in manual 1st only</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect cover, piston and seal for damage. Repair as required.</li> </ul>
<b>O/D</b>		
	<ul style="list-style-type: none"> <li>• Reverse band, manual 1st (only) damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
	<ul style="list-style-type: none"> <li>• O/D band, reverse clutch drum assembly worn or damaged (manual 2nd only)</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Reverse Band (Manual 1st Only)</b>		
	<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>

**Other Concerns: Selector Lever Efforts High**

Possible Component	Reference/Action
<b>251 - ELECTRICAL ROUTINE</b>	
<ul style="list-style-type: none"> <li>• No electrical concerns</li> </ul>	
<b>351 - HYDRAULIC/MECHANICAL ROUTINE</b>	

<b>Selector Lever Linkage, Transmission Range (TR) Sensor</b>	
<ul style="list-style-type: none"> <li>• Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <a href="#">Section 307-05</a> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <a href="#">Transmission Range (TR) Sensor Adjustment</a> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>• Brake Shift Interlock Actuator (BSIA) system, solenoid damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to <a href="#">Section 307-05</a> .</li> </ul>
<b>Manual Control Lever</b>	
<ul style="list-style-type: none"> <li>• Retaining pin damaged, nut loose, detent spring bent or damaged or park mechanism damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>• Manual valve stuck or damaged</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for damage. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>• Bolts not tightened to specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Tighten bolts to specifications.</li> </ul>

**Other Concerns: External Transmission Fluid Leaks**

Possible Component	Reference/Action
<b>252 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>• Electrical inputs/outputs, sensor seals leaking Transmission Range (TR), Output Shaft Speed (OSS), Vehicle Speed Sensor (VSS) or transmission internal wiring harness connector</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect for leakage and repair as required.</li> </ul>
<b>352 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Case</b>	
<ul style="list-style-type: none"> <li>• Case vent, case porosity, case cracked</li> </ul>	<ul style="list-style-type: none"> <li>• Check the vent for free breathing. Check the transmission fluid level. Check the transmission for overheat conditions. Repair as required.</li> </ul>

Seals/Gaskets		
	<ul style="list-style-type: none"> <li>Leakage at seals/gaskets (see the external sealing illustration for potential leak locations). Refer to <u>Leakage Inspection</u> in this section.</li> </ul>	<ul style="list-style-type: none"> <li>Remove all traces of lubricant on exposed surfaces of the transmission. Check the vent for free breathing. Operate the transmission at normal temperatures and perform fluid leakage check. Repair as required.</li> </ul>
Other		
	<ul style="list-style-type: none"> <li>Transmission fluid cooler tube fitting, torque converter drain plug, band anchor pins</li> </ul>	<ul style="list-style-type: none"> <li>Locate the source of the leak. Repair as required.</li> </ul>

**Other Concerns: Poor Vehicle Performance**

Possible Component		Reference/Action
<b>253 - ELECTRICAL ROUTINE</b>		
<b>Powertrain Control System</b>		
	<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, transmission internal wiring harness, shift solenoids, TR sensor, Torque Converter Clutch (TCC) solenoid, Transmission Fluid Temperature (TFT) sensor</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test A</u> , <u>GO to Pinpoint Test B</u> or <u>GO to Pinpoint Test C</u> . Repair as required. Clear the DTCs, road test and repeat self-test. Also refer to Routines 241/341 Torque Converter Operation Concern: Always Applied.</li> </ul>
	<ul style="list-style-type: none"> <li>Engine driveability concerns</li> </ul>	<ul style="list-style-type: none"> <li>Inspect air intake/air filter system. Check the fuel system and fuel pressure. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. Inspect the exhaust system for restriction. Refer to <u>Section 309-00</u> .</li> </ul>
<b>353 - HYDRAULIC/MECHANICAL ROUTINE</b>		
<b>Selector Lever Linkage, TR Sensor</b>		
	<ul style="list-style-type: none"> <li>Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>

Verify Correct Shift Scheduling and Engagements		
	• See Reference/Action	• Go to the appropriate diagnostic routines.
TCC Always Applied		
	• See Reference/Action	• Go to Hydraulic/Mechanical Routine 241/341.
TCC		
	• Damaged	• Inspect torque converter. Install a new converter as outlined.

### Other Concerns: Noise/Vibration - Forward Or Reverse

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to [Section 100-04](#) . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to [Section 100-04](#) for the next likely system and continue diagnosis.

Possible Component	Reference/Action
<b>254 - ELECTRICAL ROUTINE</b>	
• No electrical concerns	
<b>354 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>For Noises/Vibrations That Change With Engine Speed</b>	
• Converter components/balance weight	• Locate source of disturbance. Repair as required.
• Transmission fluid level (low) pump cavitation	
• Pump assembly	
• Engine drive accessories	
• Cooler tubes grounding out	
• Flexplate	
<b>For Noises/Vibrations That Change With Vehicle Speed</b>	
• Engine mounts loose or damaged	• Locate source of disturbance and repair as required.
• Driveline concerns:	

<ul style="list-style-type: none"> <li>◆ U-joints</li> <li>◆ Rear axle</li> <li>◆ Suspension</li> <li>◆ Modifications</li> </ul> <p>1st Gear:</p> <ul style="list-style-type: none"> <li>◆ Low One-Way Clutch (OWC)</li> <li>◆ Gearset</li> <li>◆ Friction elements</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to the following shift routine(s) for further diagnosis:</li> <li>◆ Shift 1-2, Routine 320</li> <li>◆ Shift 2-3, Routine 321</li> <li>◆ Shift 3-4, Routine 322</li> <li>◆ Shift 4-3, Routine 323</li> <li>◆ Shift 3-2, Routine 324</li> <li>◆ Shift 2-1, Routine 325</li> <li>◆ Torque Converter Cycling 242/342</li> </ul>
<ul style="list-style-type: none"> <li>• 2nd Gear:</li> <li>◆ Intermediate OWC</li> <li>◆ Intermediate clutch piston bleed hole out of 12 o'clock position</li> <li>◆ Friction elements</li> </ul>	
<ul style="list-style-type: none"> <li>• 3rd Gear:</li> <li>◆ Torque converter</li> <li>◆ Case to planet support spring</li> <li>◆ Friction elements</li> </ul>	
<ul style="list-style-type: none"> <li>• 4th Gear:</li> <li>◆ Gear set</li> <li>◆ Friction elements</li> <li>◆ Torque converter</li> </ul>	
<ul style="list-style-type: none"> <li>• Reverse:</li> <li>◆ Gear set</li> <li>◆ Friction elements</li> </ul>	
<ul style="list-style-type: none"> <li>• Output shaft splines worn or damaged</li> </ul>	
<b>Other Noises/Vibrations</b>	
<ul style="list-style-type: none"> <li>• Main controls, valve resonance</li> </ul>	
<ul style="list-style-type: none"> <li>• Selector lever cable:</li> <li>◆ Vibration</li> <li>◆ Grounding</li> <li>◆ Cooler tubes</li> <li>◆ Grounding</li> </ul>	<ul style="list-style-type: none"> <li>• Locate source of disturbance and repair as required.</li> </ul>

### Other Concerns: Engine Will Not Crank

Possible Component	Reference/Action
<b>255 - ELECTRICAL ROUTINE</b>	
<b>Powertrain Control System</b>	
<ul style="list-style-type: none"> <li>Electrical inputs/outputs, vehicle wiring harnesses, engine starting system hardware, Transmission Range (TR) sensor</li> </ul>	<ul style="list-style-type: none"> <li>Carry out self-test. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the Powertrain Control System. <u>GO to Pinpoint Test C</u> . Repair and adjust as required.</li> </ul>
<b>355 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, TR Sensor</b>	
<ul style="list-style-type: none"> <li>Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>

**Other Concerns: No Park (P) Range**

Possible Component	Reference/Action
<b>256 - ELECTRICAL ROUTINE</b>	
<ul style="list-style-type: none"> <li>No electrical concerns</li> </ul>	
<b>356 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Selector Lever Linkage, Transmission Range (TR) Sensor</b>	
<ul style="list-style-type: none"> <li>Damaged or incorrectly adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and repair as required. Verify transmission selector lever cable adjustment; refer to <u>Section 307-05</u> . Adjust transmission selector lever cable as necessary. After repairing transmission selector lever cable, verify that the TR sensor is correctly adjusted. Adjust the TR sensor as necessary, refer to <u>Transmission Range (TR) Sensor Adjustment</u> in this section.</li> </ul>
<b>Park Mechanism</b>	
<ul style="list-style-type: none"> <li>Output shaft ring, parking brake pawl, parking pawl return spring, park rod guide cup, parking pawl shaft, parking pawl actuating rod, manual control lever detent spring</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage or incorrect assembly and repair as required.</li> </ul>

	damaged or assembled incorrectly	
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**Other Concerns: Overheating**


Possible Component	Reference/Action
<b>257 - ELECTRICAL ROUTINE</b>	
<ul style="list-style-type: none"> <li>Refer to Routine 240/340, Torque Converter Operation Concern: No Apply</li> </ul>	
<b>357 - HYDRAULIC/MECHANICAL ROUTINE</b>	
<b>Transmission Fluid</b>	
<ul style="list-style-type: none"> <li>Incorrect level</li> </ul>	<ul style="list-style-type: none"> <li>Check the transmission fluid level. Adjust transmission fluid to correct level. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<ul style="list-style-type: none"> <li>Condition</li> </ul>	<ul style="list-style-type: none"> <li>Carry out Transmission Fluid Condition Check. Refer to <u>Preliminary Inspection</u> in this section.</li> </ul>
<b>Other</b>	
<ul style="list-style-type: none"> <li>Damaged, blocked or reversed cooler lines or restriction in the transmission oil cooler</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage and correct installation. Repair as required.</li> </ul>
<ul style="list-style-type: none"> <li>Damaged or blocked thermostatic bypass valve</li> </ul>	<ul style="list-style-type: none"> <li>A thermostatic bypass valve that is stuck closed will allow fluid to flow through the fluid cooler tubes but will not circulate through the transmission fluid cooler. Refer to <u>Section 307-02</u>.</li> </ul>
<b>Vehicle Concerns Causing Engine Overheating</b>	
	<ul style="list-style-type: none"> <li>Refer to the appropriate engine cooling section.</li> </ul>
<b>Main Controls</b>	
<ul style="list-style-type: none"> <li>Drain back valve, torque clutch control valve, converter limit valve stuck, damaged or assembled incorrectly</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for damage and repair as required.</li> </ul>
<b>Torque Converter Clutch (TCC)</b>	
<ul style="list-style-type: none"> <li>No apply</li> </ul>	<ul style="list-style-type: none"> <li>Refer to Routine 240/340.</li> </ul>





**Transmission Fluid Cooler Tubes Backflushing and Cleaning**

## Special Tool(s)

	<b>Transmission Heated Cooler Line Flusher</b> 222-00007, 222-00004 or equivalent
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## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A**.

2. **NOTICE:** When internal wear/damage occurs in the transmission, metal particles, clutch plate material and band material can travel into the torque converter, the transmission fluid cooler tubes and the transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns. To prevent future concerns, remove these contaminants from the cooling system before placing the transmission back into use.

**NOTICE:** The transmission fluid cooler is not repairable with existing equipment due to the thermostatic bypass valve. Do not attempt to backflush and clean the transmission fluid cooler. Install a new transmission fluid cooler if there is leakage from the transmission fluid cooler, major metallic failure, multiple clutch or clutch plate failure, or sufficient component wear that result in metallic contamination.

**NOTICE:** Use transmission fluid specified for this transmission. Do not use any supplemental transmission fluid additives or cleaning agents. The use of these products could cause internal transmission components to fail, which will affect the operation of the transmission.

**NOTE:** Transmission fluid cooler backflushing and cleaning will be performed using the Transmission Heated Cooler Line Flusher or equivalent. Follow the manufacturer's instructions included with the machine. Test the equipment to make sure that a vigorous fluid flow is present before proceeding.

**NOTE:** If the vehicle is equipped with an in-line transmission fluid filter, remove and discard the in-line filter.

If required, install a new transmission fluid cooler. For additional information, refer to Section 307-02.


3. Make sure to top off the fluid level of the cooler line flusher with transmission fluid.
4. Allow the transmission fluid in the cooler line flusher 15-30 minutes to warm up to 60°C (140°F) before using.
5. Install the line adapters onto the transmission cooler tubes.
6. Attach the cooler line flusher red line to the transmission fluid cooler pressure tube quick connect fitting.
7. Attach the cooler line flusher blue line to the transmission fluid cooler return tube quick connect fitting.
8. Follow the equipment instructions to purge the transmission fluid cooler tubes prior to starting the flushing procedure.
9. Allow the cooling system to backflush for 10-15 minutes, then flush in a normal flow direction for an additional 10-15 minutes.
10. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Transmission Fluid Drain and Refill

### Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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### Material

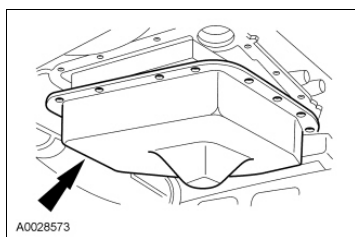
Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

### Draining

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

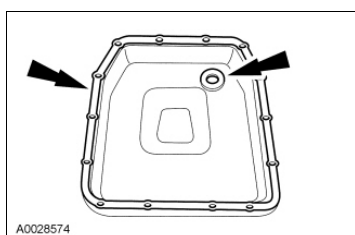
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Loosen the transmission fluid pan bolts and allow the fluid to drain. After the fluid has drained, remove the transmission fluid pan.



3. **NOTE:** Do not remove the transmission fluid filter. It is not necessary to change the transmission fluid filter during a normal maintenance fluid change.

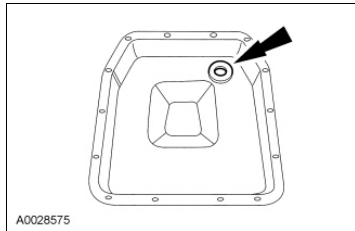
Clean and inspect the transmission fluid pan, transmission fluid pan gasket and magnet.



4. Thoroughly flush the transmission fluid cooler tubes. For additional information, refer to Transmission Fluid Cooler Tubes Backflushing and Cleaning in this section.

## Refill

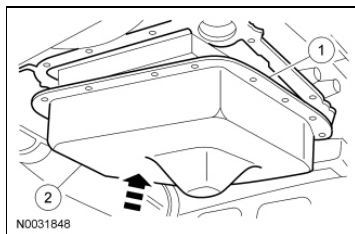
1. Position the magnet into the transmission fluid pan.



2. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket.

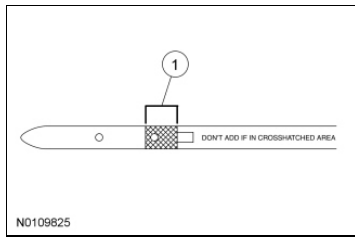
1. Position the transmission fluid pan with the gasket in place.
2. Install the bolts.
  - ◆ Tighten to 14 Nm (124 lb-in).



3. **NOTICE:** The use of any other transmission fluid may result in the transmission failing to operate in a normal manner or transmission failure.

Fill the transmission.

- Add 4.7L (5 qt) of automatic transmission fluid to the transmission through the fluid filler tube.
4. Start the engine. Move the transmission selector lever through all the gear ranges, checking for engagements.
  5. Fill the transmission to the correct level.
    1. Using the scan tool, start and run the engine until the transmission is at normal operating temperature 66-77°C (150-170°F), check and adjust the transmission fluid level, and check for any leaks. If transmission fluid is needed, add fluid in increments of 0.24L (0.5 pt) until the correct level is achieved (fluid should be in the cross-hatched area of the fluid level indicator).





6. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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**Transmission Fluid Exchange**

## Special Tool(s)

	Heavy-Duty Transmission and Power Steering Fluid X-Changer 078-00531 or equivalent
	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

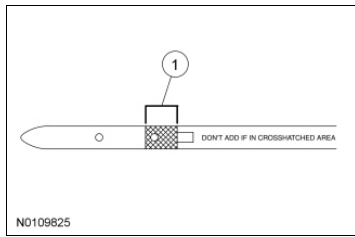
**NOTICE:** Use transmission fluid specific for this transmission. Do not use any supplemental transmission fluid additives or cleaning agents. The use of these products can cause internal transmission components to fail, which will affect the operation of the transmission.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Use the Heavy-Duty Transmission and Power Steering Fluid X-Changer to change the fluid.
3. Connect the Heavy-Duty Transmission and Power Steering Fluid X-Changer to the transmission fluid cooler tube after the Oil-To-Air (OTA) transmission fluid cooler on the return tube. This will help remove any foreign material trapped in the transmission fluid coolers.
4. Perform the transmission fluid exchange using the Heavy-Duty Transmission and Power Steering Fluid X-Changer. Follow the manufacturer's instructions included with the machine.
5. Once the transmission fluid exchange is completed, disconnect the Heavy-Duty Transmission and Power Steering Fluid X-Changer. Reconnect any disconnected transmission fluid cooler tubes.
6. Start the engine. Move the selector lever through all the gear ranges, checking for engagements.
7. Fill the transmission to the correct level.
  1. Using the scan tool with the engine running, check and make sure that the transmission is at normal operating temperature 66-77°C (150-170°F). Check and adjust the transmission fluid level and check for any leaks. If transmission fluid is needed, add fluid in increments of 0.24L

(0.5 pt) until the correct level is achieved (fluid should be in the cross-hatched area of the fluid level indicator).



8. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.


If equipped with a fire suppression system, repower the system.

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**Transmission Range (TR) Sensor Adjustment**

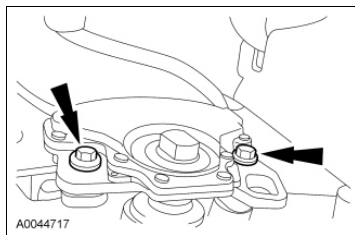
## Special Tool(s)

 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
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1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

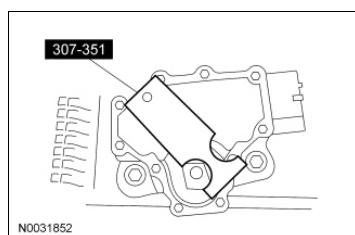
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Loosen the Transmission Range (TR) sensor bolts.



3. **NOTE:** Make sure that the manual control lever is in the NEUTRAL position.

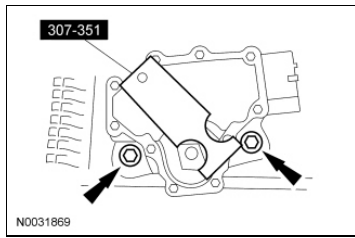
Using the TR Sensor Alignment Gauge, align the TR sensor slots. The tool is designed to fit snugly.



4. **NOTICE:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

Tighten the TR sensor bolts and remove the TR Sensor Alignment Gauge.

- Tighten to 9 Nm (80 lb-in).



5. Verify that the vehicle starts in the PARK and NEUTRAL positions and the reverse lamps illuminate in REVERSE.
6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system.**  
**For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Torque Converter Contamination Inspection**

## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

1. A new or remanufactured torque converter must be installed if one or more of the following statements is true:
  - A torque converter malfunction has been determined based on complete diagnostic procedures.
  - The torque converter stud or studs, impeller hub or bushing are damaged.
  - The torque converter exhibits external discoloration (due to overheating).
  - There is evidence of transmission assembly or fluid contamination due to the following transmission or converter failure modes.
    - ◆ Major metallic failure
    - ◆ Multiple clutch plates or band failures
    - ◆ Sufficient component wear which results in metallic contamination
    - ◆ Water or antifreeze contamination
2. If none of the above conditions are present, continue with the following fluid inspection.
3. Pour a small amount of transmission fluid from the torque converter onto an absorbent white tissue or through a paper filter.
4. Examine the fluid for contaminants, color and smell. The fluid must be free of contaminants, red in color and not have a burnt smell.
5. **NOTICE: Do not use water-based cleaners or mineral spirits to clean or flush the torque converter or transmission damage will occur.**

If the fluid passed inspection:

- drain the remaining fluid from the torque converter.
  - using only the recommended transmission fluid, add 1.9L (2 qt) of clean fluid into the converter and agitate by hand.
  - thoroughly drain the fluid.
-



**Fluid Pan, Gasket and Filter**

## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

**Removal**

**NOTICE:** Do not use any supplemental transmission fluid additives or cleaning agents. The use of these products could cause internal transmission components to fail; this will affect the operation of the transmission.

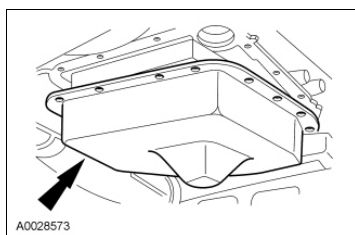
Using fluid other than specified may result in transmission failure.

**NOTE:** Normal maintenance requires periodic transmission fluid changes. If a major repair, such as a clutch, band or bearing is required, the automatic transmission must be removed for repair.

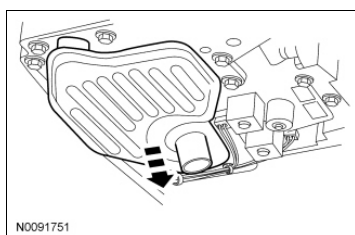
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

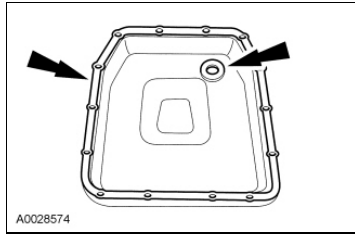
2. Loosen the transmission fluid pan bolts and allow the fluid to drain. After the fluid has drained, remove the bolts. Remove the transmission fluid pan and transmission fluid pan gasket.



3. Pull down evenly and remove the transmission fluid filter and seal.



4. Clean and inspect the transmission fluid pan, transmission fluid pan gasket and the magnet.

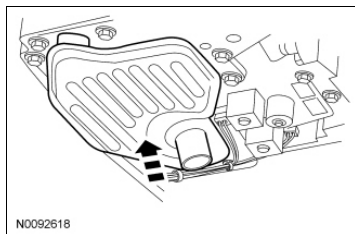


## Installation

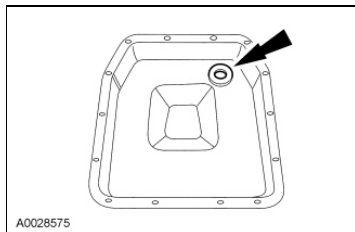
1. **NOTICE:** If installing a new transmission fluid filter, and the seal remains in the main control bore, carefully use a small screwdriver to remove the seal. Use care not to damage the main control bore.

**NOTE:** If transmission is being serviced for a contamination-related failure, use a new transmission fluid filter and seal. The filter may be reused if no excessive contamination is present.

Install a new transmission fluid filter and seal as required.



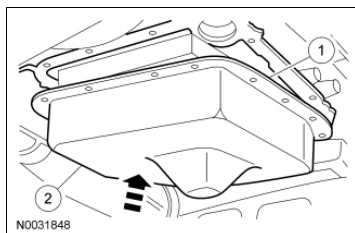
2. Position the pan magnet into the transmission fluid pan.



3. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage, if not damaged, the gasket should be reused.

Install the transmission fluid pan and gasket.

1. Position the transmission fluid pan and gasket in place.
2. Install the transmission fluid pan bolts.
  - ◆ Tighten to 14 Nm (124 lb-in).



4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these

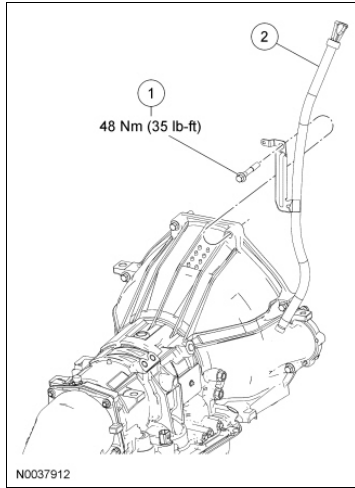
**instructions may result in serious personal injury.**

**NOTE:** Start by filling the transmission with 4.7L (5 qt) of transmission fluid.

Fill the transmission to the correct fluid level, using transmission fluid.

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## Transmission Filler Tube



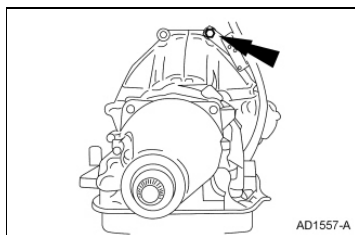
Item	Part Number	Description
1	N606065-S	Transmission filler tube bolt
2	7A228	Transmission filler tube

### Removal and Installation

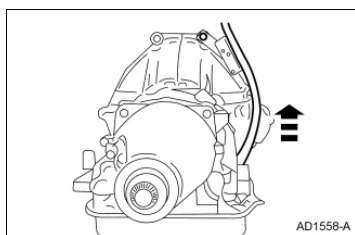
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. Remove the transmission filler tube bolt.



3. Remove the transmission filler tube.



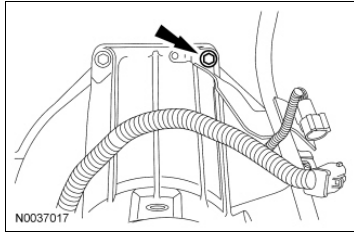
4. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.



**For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Tighten to 48 Nm (35 lb-ft).



## Main Control Valve Body

### Removal

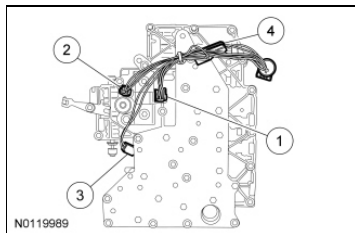
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

Drain the transmission fluid and remove the transmission fluid pan and transmission fluid filter. For additional information, refer to **Fluid Pan, Gasket and Filter** in this section.

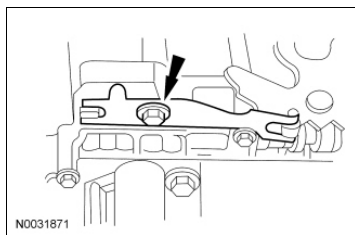
2. **NOTICE:** Carefully pry up on the locking tabs to disconnect the solenoids. Disconnect the transmission internal harness from the solenoids.

Disconnect the transmission internal harness from the solenoids.

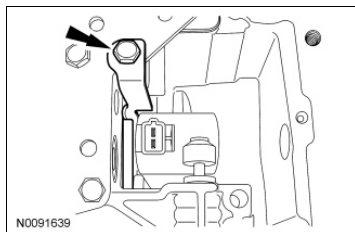
1. Disconnect Shift Solenoid A (SSA) and Shift Solenoid B (SSB).
2. Disconnect the Torque Converter Clutch (TCC).
3. Disconnect the Electronic Pressure Control (EPC) solenoid.
4. Disconnect the Transmission Fluid Temperature (TFT) sensor.



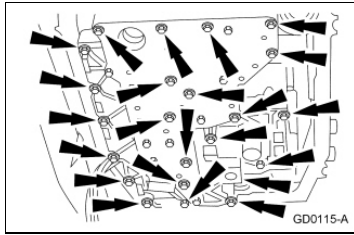
3. Remove the manual control valve detent lever spring and bolt.



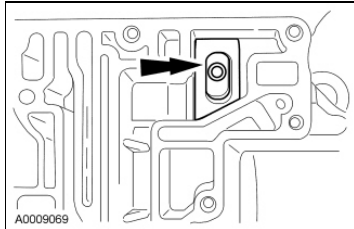
4. Remove the bolt and the EPC solenoid bracket.



5. Remove the 23 main control valve body bolts.



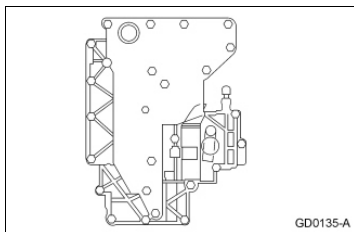
6. Remove the main control valve body and discard the pump outlet screen.



## Installation

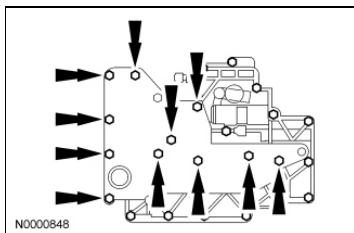
1. **NOTE:** Make sure that the drive pin of the manual valve detent lever assembly engages the manual valve in the correct location prior to installing the bolts.

Position the main control valve body gasket and main control valve body using the 2 alignment bolts as a guide.



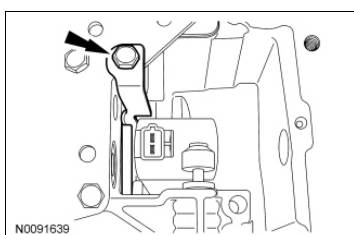
2. **NOTE:** The main control valve body bolts will be tightened in later steps.

Loosely install the 11 long main control valve body bolts.

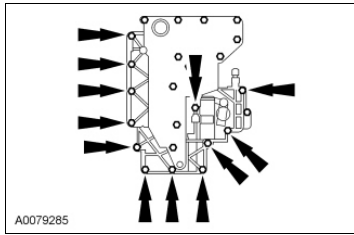


3. **NOTE:** Lubricate the EPC solenoid O-rings with automatic transmission fluid.

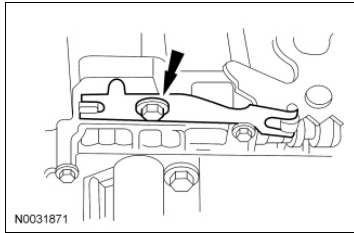
Position the EPC solenoid bracket and loosely install the bolt.



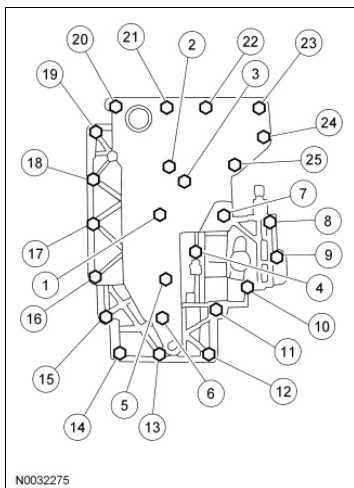
4. The main control valve body bolts will be tightened in later steps.
  - Loosely install the 12 short main control valve body bolts.



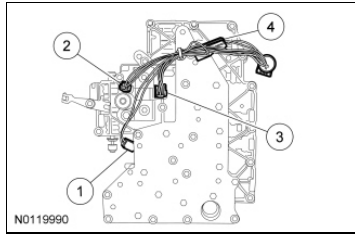
5. Install the manual control valve detent lever spring and loosely install the bolt.



6. Tighten the main control valve body bolts in the sequence shown.
  - Tighten to 10 Nm (89 lb-in).

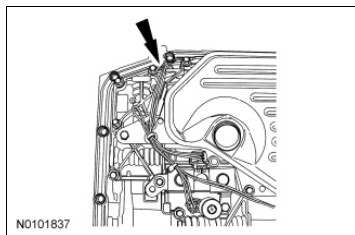


7. Inspect the transmission internal harness for damage.
8. Connect the transmission internal harness to the solenoids.
  1. Connect the EPC solenoid by pressing it in place by hand and fully seating the connector in place.
  2. Connect the TCC by pressing it in place by hand and fully seating the connector in place.
  3. Connect the shift solenoid SSA and SSB by pressing it in place by hand and fully seating the connector in place.
  4. Connect the TFT solenoid by pressing it in place by hand and fully seating the connector in place.



9. **NOTICE:** The transmission internal wire harness needs to be properly routed to avoid the potential of damage to the harness. Pinched or trapped wires may result in a transmission failure.

Make sure that the internal wire harness is properly routed.



10. Install the transmission fluid pan and transmission fluid filter. For additional information, refer to Fluid Pan, Gasket and Filter in this section.
11. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

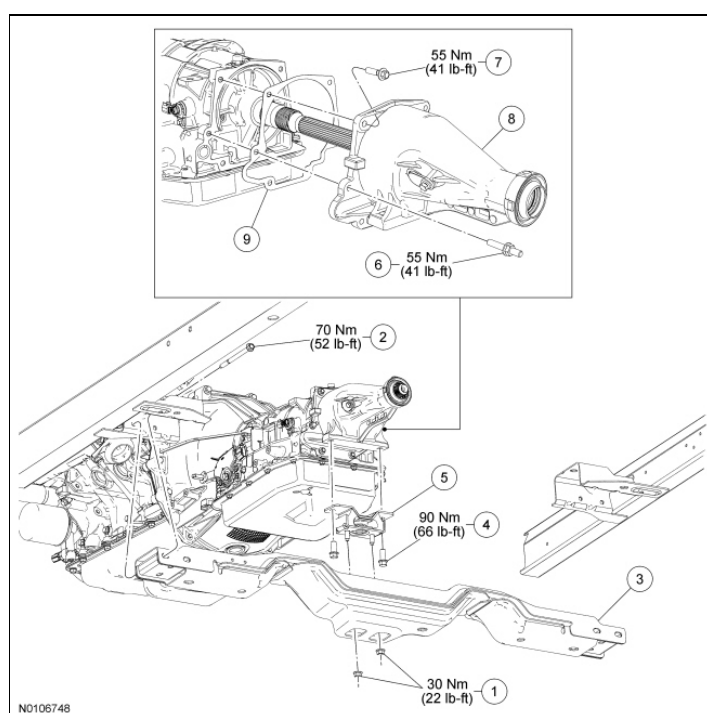
If equipped with a fire suppression system, repower the system.

---

## Extension Housing Gasket

### Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV



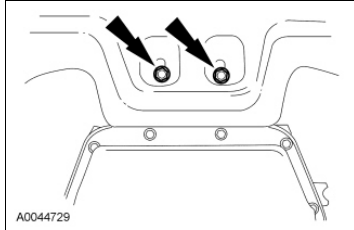
Item	Part Number	Description
1	W520514	Transmission insulator and retainer nuts
2	W709208	Transmission support crossmember bolt (4 required)
3	5027	Transmission support crossmember
4	387174	Transmission insulator and retainer bolt
5	6D091	Transmission insulator and retainer
6	N803521	Extension housing stud (2 required)
7	N803747	Extension housing bolt (4 required)
8	7A039	Extension housing
9	7086	Extension housing gasket

### Removal

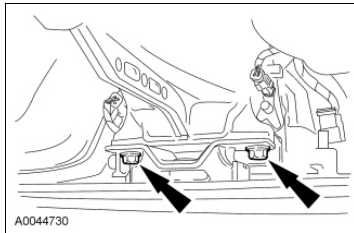
- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

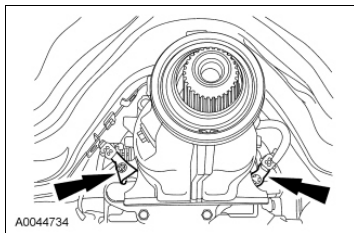
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#).
3. Remove the transmission insulator and retainer nuts.



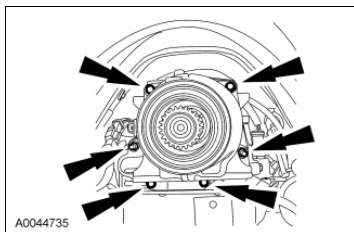
4. Remove the exhaust system. For additional information, refer to [Section 309-00](#).
5. Install a suitable transmission jack.
6. Remove the transmission support crossmember. For additional information, refer to [Transmission Support Crossmember](#) in this section.
7. Remove the transmission insulator and retainer bolts.



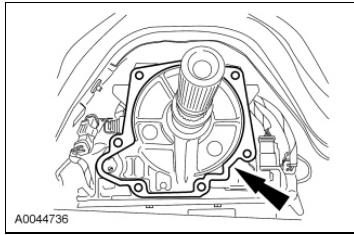
8. Remove the LH and RH catalyst monitor connector retainers.



9. Remove the extension housing bolts and the extension housing.

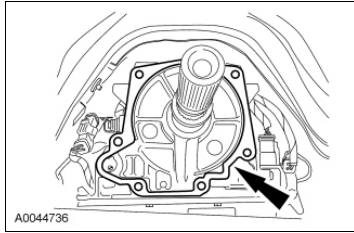


10. Remove the extension housing gasket.

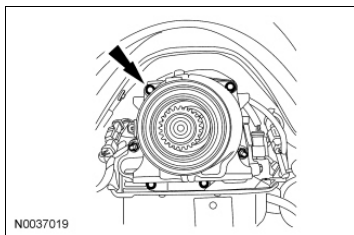


## Installation

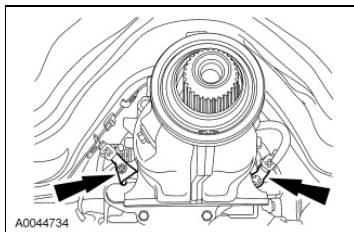
1. Install a new extension housing gasket.



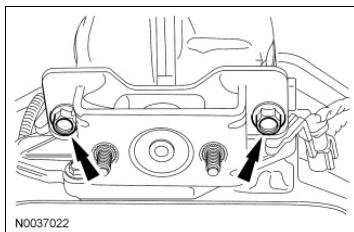
2. Install the extension housing and the bolts.
  - Tighten to 55 Nm (41 lb-ft).



3. Install the LH and RH catalyst monitor connector retainers.



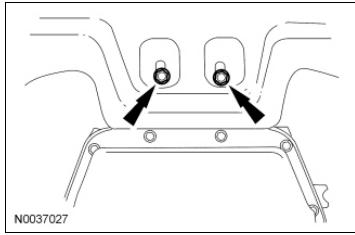
4. Install the transmission insulator and retainer and the transmission insulator and retainer bolts.
  - Tighten to 90 Nm (66 lb-ft).



5. Install the transmission support crossmember. For additional information, refer to [Transmission Support Crossmember](#) in this section.
6. Lower the transmission onto the transmission support crossmember and install the transmission insulator nuts.



- Tighten to 30 Nm (22 lb-ft).




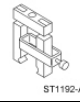

7. Remove the transmission jack.
8. Install the exhaust system. For additional information, refer to [Section 309-00](#) .
9. Install the driveshaft. For additional information, refer to [Section 205-01](#) .
10. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

Check the transmission fluid level. For additional information, refer to [Transmission Fluid Drain and Refill](#) in this section.

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## Extension Housing Seal

### Special Tool(s)

 ST1188-A	Installer, Transmission Extension Housing Oil Seal 308-002 (T61L-7657-A)
 ST1192-A	Remover, Transmission Fluid Seal 307-048 (T74P-77248-A)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)

### Material

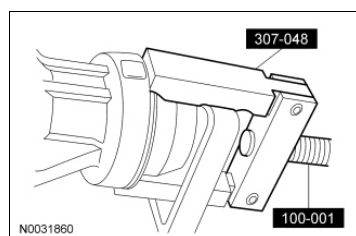
Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

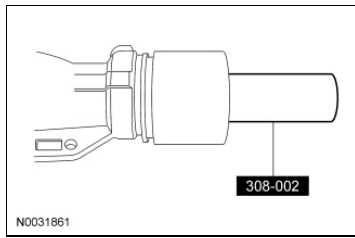
2. Remove the driveshaft. For additional information, refer to [Section 205-01](#) .
3. Using the Transmission Fluid Seal Remover and Slide Hammer, remove the extension housing seal.



### Installation

1. **NOTE:** When installing the new seal, make sure that the drain hole in the seal is in the 6 o'clock position.

Using the Transmission Extension Housing Oil Seal Installer, install a new extension housing seal.



2. Install the driveshaft. For additional information, refer to Section 205-01 .
3. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Check the level of the transmission fluid. Add transmission fluid as necessary.

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## Electronic Pressure Control (EPC) Solenoid

### Material

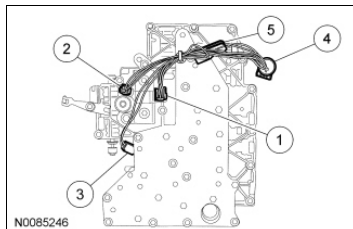
Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

### Removal

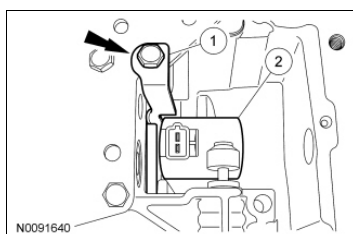
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Remove the manual control lever. For additional information, refer to [Manual Control Lever Shaft and Seal](#) in this section.

2. Disconnect the transmission internal harness from the solenoids.
  1. Disconnect Shift Solenoid A (SSA) and Shift Solenoid B (SSB).
  2. Disconnect the Torque Converter Clutch (TCC).
  3. Disconnect the Electronic Pressure Control (EPC) solenoid.
  4. Disconnect the transmission internal harness connector.
  5. Disconnect the Transmission Fluid Temperature (TFT) sensor.



3. Remove the EPC solenoid.
  1. Remove the bolt and EPC solenoid bracket.
  2. Remove the EPC solenoid.

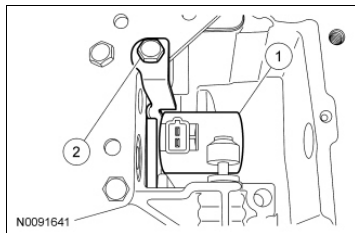


### Installation

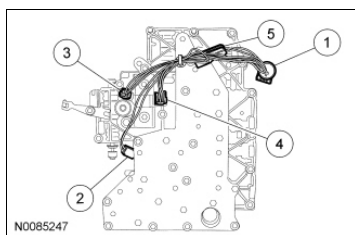
1. **NOTE:** Lubricate the EPC solenoid O-rings with transmission fluid.

Install the EPC solenoid.

1. Install the EPC solenoid.
2. Install the EPC solenoid bracket and bolt.
  - ◆ Tighten to 10 Nm (89 lb-in).

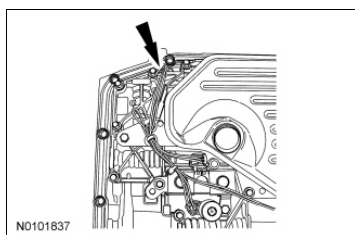


2. Inspect the transmission internal harness for damage.
3. Connect the transmission internal harness to the solenoids.
  1. Connect the transmission internal harness connector by pressing it in place by hand and fully seating the connector in place.
  2. Connect the EPC solenoid by fully seating the connector in place.
  3. Connect the TCC solenoid by fully seating the connector in place.
  4. Connect the SSA and SSB by fully seating the connector in place.
  5. Connect the TFT sensor.



4. **NOTICE:** The transmission internal wire harness must be properly routed to avoid the potential of damage to the harness. Pinched or trapped wires may result in a transmission failure.

Make sure the internal wire harness is properly routed.





5. Install the manual control lever. For additional information, refer to Manual Control Lever Shaft and Seal in this section.
6. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.



## Manual Control Lever Shaft and Seal

### Special Tool(s)

	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
	Installer, Shift Shaft Fluid Seal 307-050 (T74P-77498-A)

### Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

### Removal

**NOTICE:** Do not use any supplemental transmission fluid additives or cleaning agents. The use of these products could cause internal transmission components to fail; this will affect the operation of the transmission.

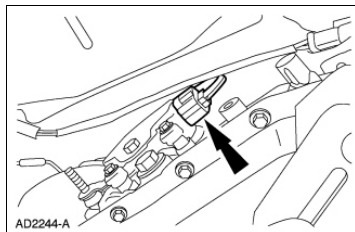
Use of a fluid other than specified could result in transmission failure.

**NOTE:** Normal maintenance requires periodic automatic transmission fluid changes. If a major repair, such as a clutch, band or bearing is required, the automatic transmission must be removed for repair.

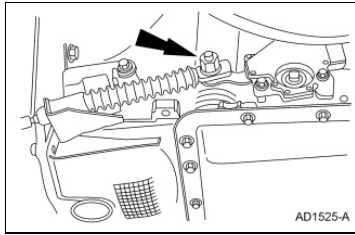
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

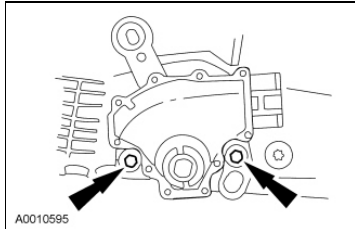
2. Disconnect the Transmission Range (TR) sensor electrical connector.



3. Disconnect the selector lever cable.

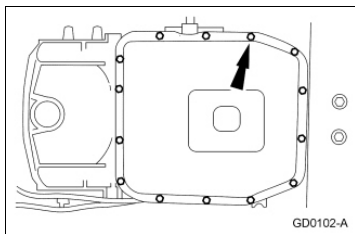


4. Remove the TR sensor bolts and the TR sensor.

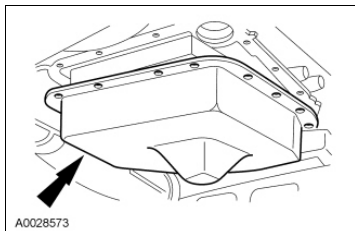


5. Drain the transmission fluid.

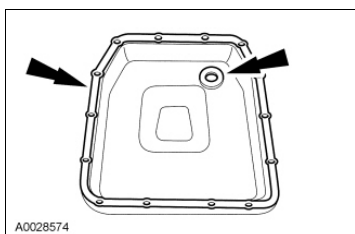
- Loosen the transmission fluid pan bolts and allow transmission fluid to drain. After the transmission fluid has drained, remove the bolts.



6. Remove the transmission fluid pan and transmission fluid pan gasket.

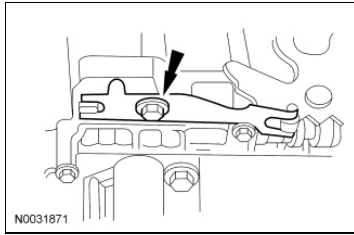


7. Clean and inspect the transmission fluid pan, transmission fluid pan gasket and the magnet.



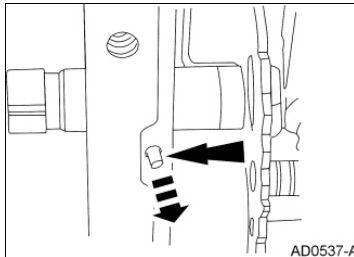
8. Remove the manual control valve detent lever bolt and spring.



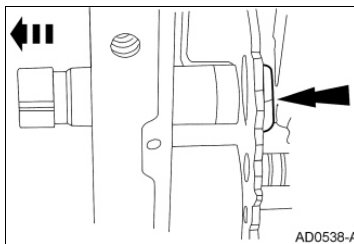


9. **NOTE:** Use a shop cloth to protect the transmission case surface.

Remove the manual lever shaft retaining pin.

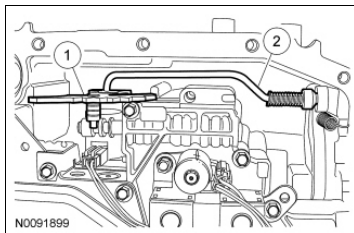


10. Remove the manual control lever nut and slide the manual control lever shaft out of the case.



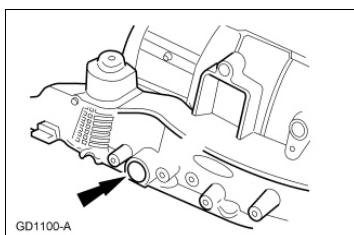
11. If required, remove the parking lever actuating rod assembly.

1. Remove the manual valve detent lever.
2. Remove the parking lever actuating rod.



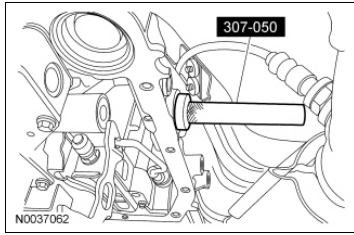
12. **NOTICE:** Use care not to damage the manual control lever shaft bore or the new seal may leak due to damage to the bore.

Remove the manual control lever shaft seal.

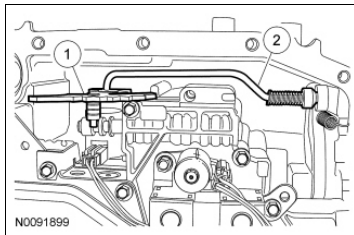


## Installation

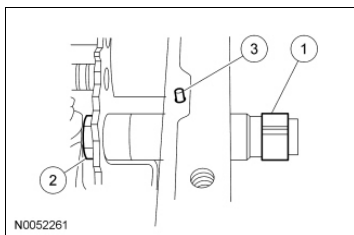
1. Using the Shift Shaft Fluid Seal Installer, install the manual control lever shaft seal.



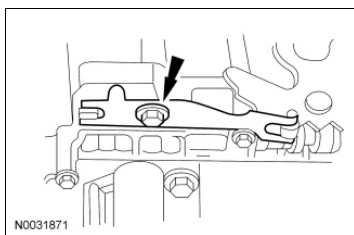
2. If required, install the parking lever actuating rod assembly.
  1. Install the parking lever actuating rod.
  2. Install the manual valve detent lever.



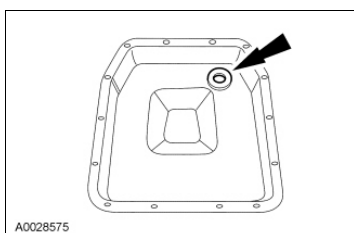
3. Install the manual control lever shaft.
  1. Slide the manual control lever shaft into the case.
  2. Install the manual control lever shaft inner nut.
    - ◆ Tighten to 32 Nm (24 lb-ft).
  3. Install the manual control lever shaft retaining pin.



4. Install the manual valve detent lever spring and bolt.
  - Tighten to 10 Nm (89 lb-in).



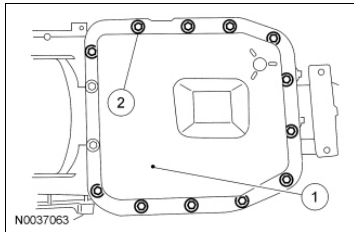
5. Position the pan magnet into the transmission fluid pan.



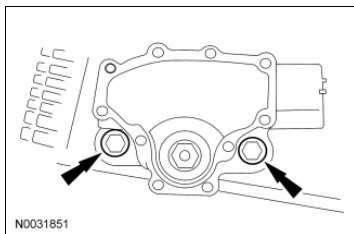
6. **NOTE:** The transmission fluid pan gasket is reusable, clean and inspect for damage, if not damaged, the gasket should be reused.

Install the transmission fluid pan and transmission fluid pan gasket.

1. Position the transmission fluid pan and transmission fluid pan gasket in place.
2. Install the transmission fluid pan bolts.
  - ◆ Tighten to 14 Nm (124 lb-in).

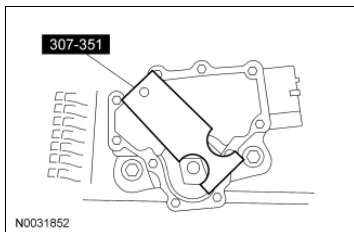


7. Install the TR sensor and loosely install the bolts.



8. **NOTE:** The manual control lever shaft must be in the NEUTRAL position.

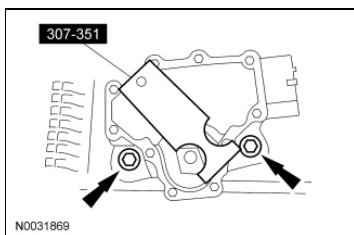
Using the TR Sensor Alignment Gauge, align the TR sensor slots. The TR Sensor Alignment Gauge is designed to fit snugly.



9. **NOTICE:** Tightening one screw before tightening the other may cause the Transmission Range (TR) sensor to bind or become damaged.

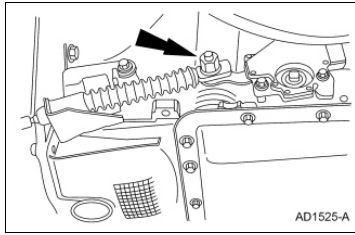
Tighten the bolts in an alternating sequence.

- Tighten to 9 Nm (80 lb-in).

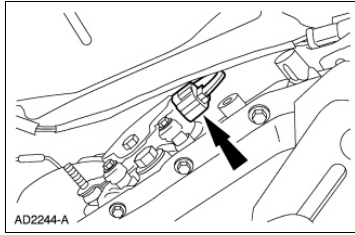


10. With the manual lever in the (D) position, connect the selector lever cable.

- Tighten to 30 Nm (22 lb-ft).



11. Connect the TR sensor electrical connector.




12. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
**For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

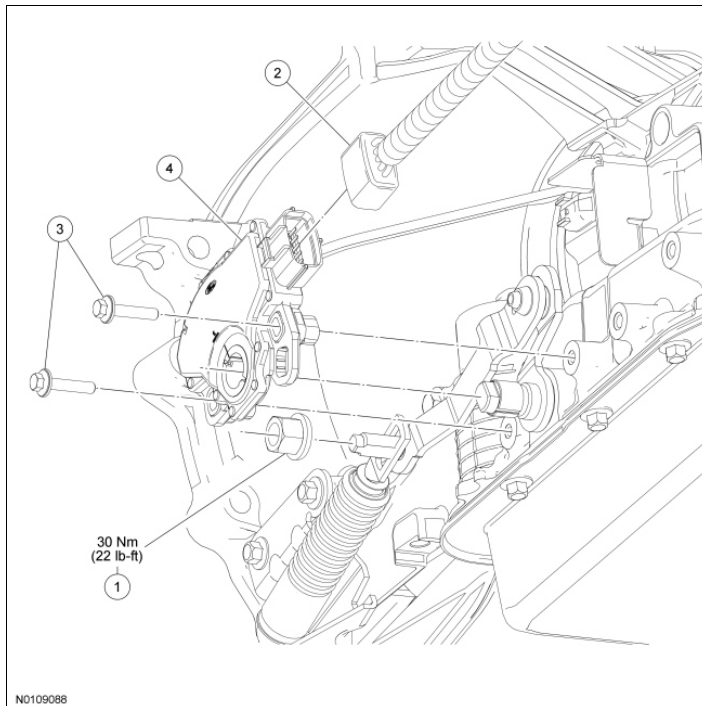
**NOTE:** Start by filling the transmission with 4.7L (5 qt) of automatic transmission fluid.

Fill the transmission to the correct fluid level, using automatic transmission fluid.

**Digital Transmission Range (TR) Sensor**

## Special Tool(s)

 ST1633-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
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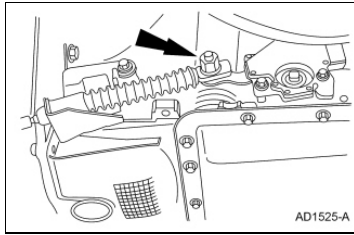
Item	Part Number	Description
1	N808356	Selector lever cable nut
2	-	Transmission Range (TR) sensor electrical connector
3	N806933	TR sensor bolts
4	7F293	TR sensor

**Removal**

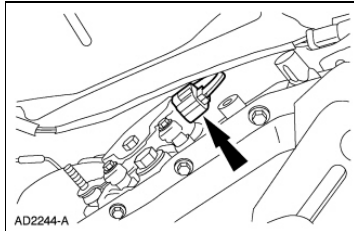
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

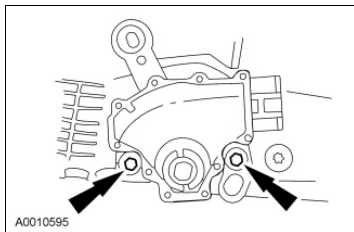
2. Disconnect the selector lever cable.



3. Disconnect the Transmission Range (TR) sensor connector.

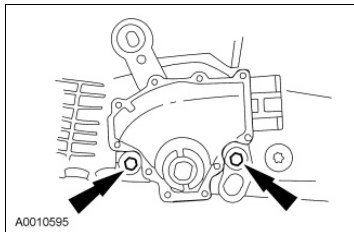


4. Remove the bolts and remove the TR sensor.



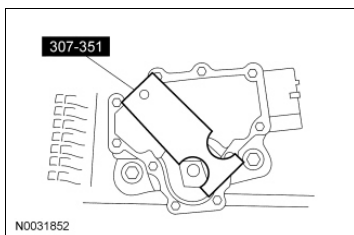
## Installation

1. Install the TR sensor and loosely install the bolts.



2. **NOTE:** The manual control lever must be in the NEUTRAL position.

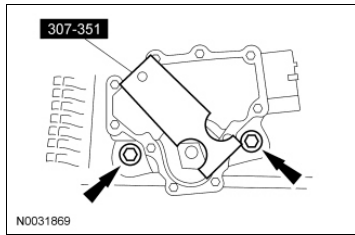
Using the TR Sensor Alignment Gauge, align the TR sensor slots. The TR Sensor Alignment Gauge is designed to fit snugly.



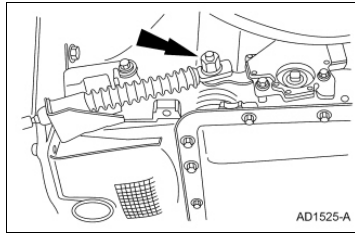
3. **NOTICE:** Tightening one screw before tightening the other may cause the Transmission Range (TR) sensor to bind or become damaged.

Tighten the screws in an alternating sequence.

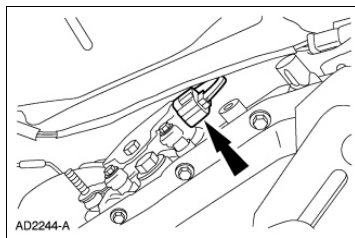
- Tighten to 9 Nm (80 lb-in).



4. With the manual lever in the (D) position, connect the selector lever cable.
  - Tighten to 30 Nm (22 lb-ft).



5. Connect the TR sensor electrical connector.



6. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.




If equipped with fire a suppression system, repower the system.





## Reverse Servo Assembly

### Special Tool(s)

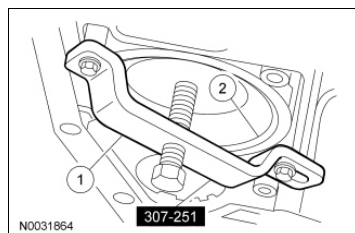
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)
 ST1202-A	Installer, Servo Piston 307-073 (T80L-77030-A)
 ST1210-A	Remover/Installer, Servo Piston 307-251 (T92P-70023-A)

### Removal

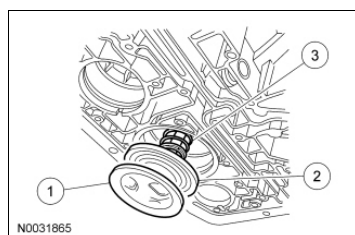
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Remove the main control valve body. For additional information, refer to Main Control Valve Body in this section.

2. Using the Servo Piston Remover/Installer, remove the reverse band servo retaining ring.
  1. Compress the servo spring.
  2. Remove the reverse band servo retaining ring.



3. Remove the reverse servo assembly.
  1. Remove the reverse band servo cover.
  2. Remove the reverse band servo piston and rod.
  3. Remove the reverse band servo spring.



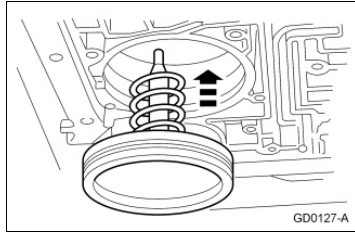
### Installation

**NOTE:** This is not an ordinary installation procedure and does not compensate for band wear.

1. **NOTE:** Lubricate the reverse piston seal to facilitate assembly and prevent damage to the seal.

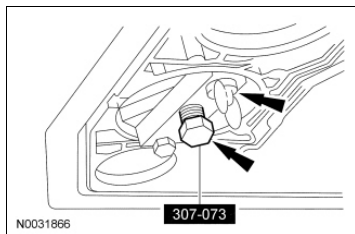
Install the reverse servo return spring and piston.

- Do not install the piston cover.



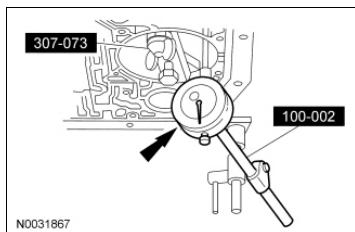
2. Install the Servo Piston Installer and tighten the band apply bolt.

- Tighten to 5.6 Nm (50 lb-in).

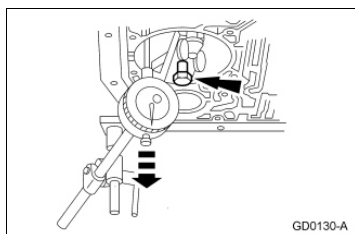


3. Attach the Dial Indicator Gauge with Holding Fixture to the transmission.

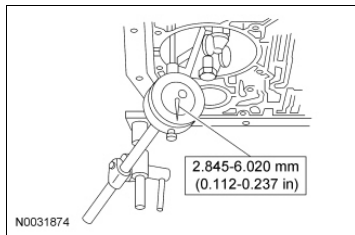
- Position the Dial Indicator Gauge stem on the flat portion of the reverse servo piston and zero the Dial Indicator Gauge.



4. Loosen the bolt until the piston stops against the Dial Indicator Gauge.

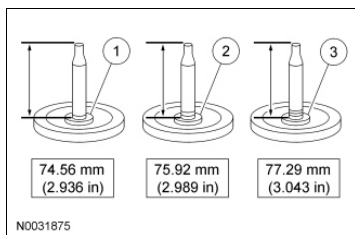


5. Verify the amount of piston travel on the Dial Indicator Gauge is within specification.

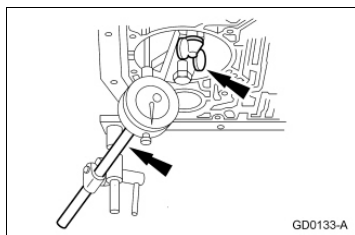


6. If piston travel is not within specification, select and install the correct servo piston assembly to bring the servo piston travel within specification.

1. One groove
2. Two groove
3. Three groove

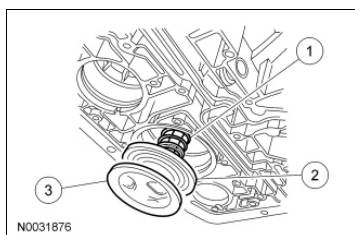


7. Remove the Dial Indicator Gauge with Holding Fixture and servo selection tool.



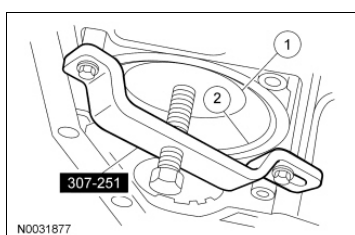
8. Install the correct reverse servo assembly.


1. Install the reverse band servo spring.
2. Install the reverse band servo piston and rod.
3. Install the reverse band servo cover.



9. Using the Servo Piston Remover/Installer, install the reverse servo retaining ring.

1. Compress the servo spring.
2. Install the reverse band servo retaining ring.



10. Install the main control valve body. For additional information, refer to Main Control Valve Body in this section.
11.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Overdrive Servo

### Special Tool(s)

 ST1210-A	Remover/Installer, Servo Piston 307-251 (T92P-70023-A)
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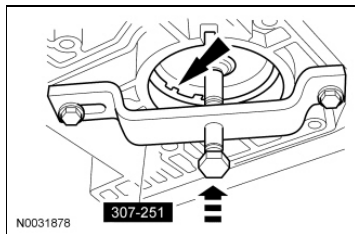
### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

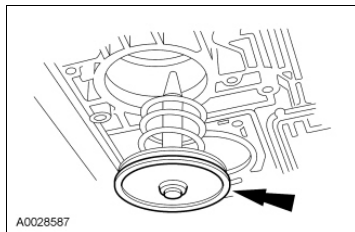
Remove the main control valve body. For additional information, refer to [Main Control Valve Body](#) in this section.

2. **NOTE:** If the Servo Piston Remover/Installer tool is not available, extreme care must be taken. Spring pressure will force Overdrive (O/D) servo piston assembly out of case. Case bore damage may result from trying to pry on O/D servo internal retaining ring.

Using the Servo Piston Remover/Installer, compress the servo spring to remove the O/D servo retaining ring.

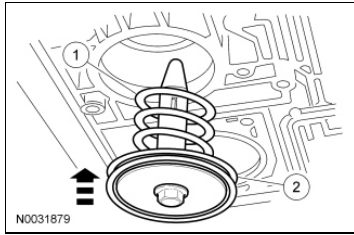


3. Remove the O/D servo piston and return spring.

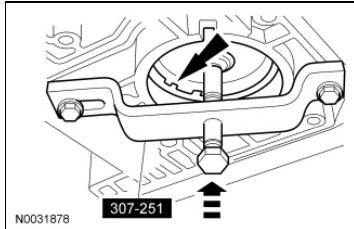


### Installation

1. Install the O/D servo piston assembly.
  1. Install the O/D servo piston return spring.
  2. Install the O/D servo piston assembly.



2. Use the Servo Piston Remover/Installer to install the O/D servo piston retaining ring.



3. Install the main control valve body. For additional information, refer to Main Control Valve Body in this section.
4. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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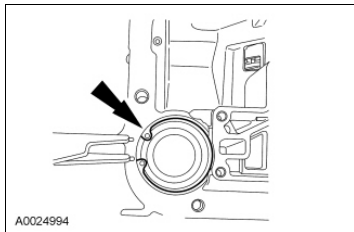
## 1-2 Accumulator

### Removal

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

Drain the transmission fluid and remove the transmission fluid pan and filter. For additional information, refer to **Fluid Pan, Gasket and Filter** in this section.

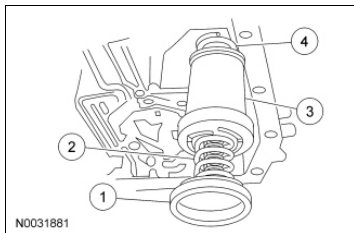
2. Compress the 1-2 accumulator cover and remove the accumulator piston retaining ring.



3. **NOTE:** Note the location of the 1-2 accumulator springs for reference during assembly.

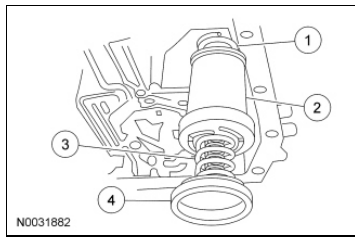
Remove the 1-2 accumulator.

1. Remove the 1-2 accumulator cover.
2. Remove the inner and outer lower 1-2 accumulator spring.
3. Remove the accumulator piston.
4. Remove the upper 1-2 accumulator spring.

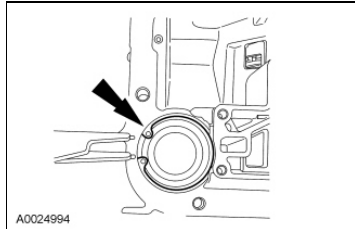


### Installation

1. Install the 1-2 accumulator.
  1. Install the 1-2 accumulator upper spring.
  2. Install the accumulator piston.
  3. Install the inner and outer lower 1-2 accumulator spring.
  4. Install the cover and seal assembly.



2. Compress the accumulator and install the accumulator piston retaining ring.



3. Install the transmission fluid pan and filter. For additional information, refer to Fluid Pan, Gasket and Filter in this section.
4. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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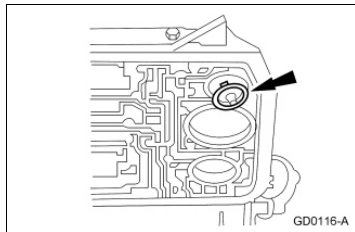
## 2-3 Accumulator

### Removal

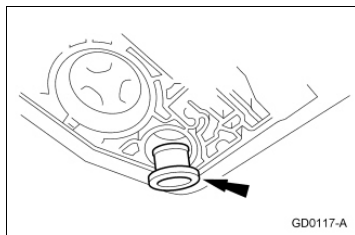
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Remove the main control valve body. For additional information, refer to Main Control Valve Body in this section.

2. Remove the 2-3 accumulator piston retainer.

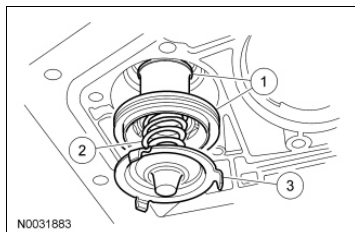


3. Remove the accumulator piston and spring.



### Installation

1. Install the 2-3 accumulator assembly.
  1. Install the accumulator piston.
  2. Install the accumulator piston spring.
  3. Install the accumulator spring retainer.



2. Install the main control valve body. For additional information, refer to Main Control Valve Body in this section.

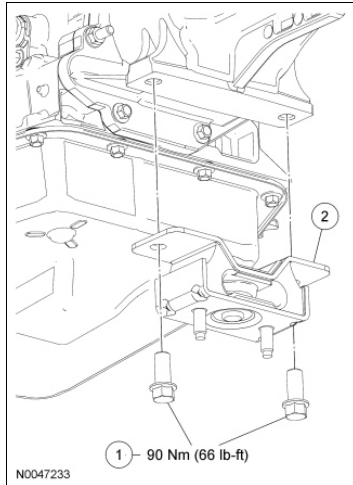
3. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these

**instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Transmission Insulator and Retainer



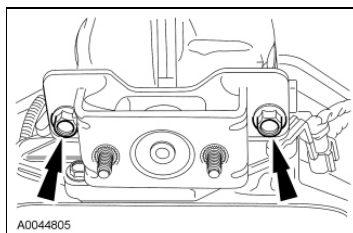
Item	Part Number	Description
1	387174	Transmission insulator and retainer bolts
2	6D091	Transmission insulator and retainer

### Removal

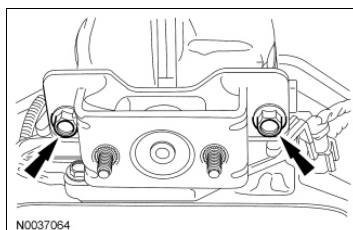
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.


Remove the transmission support crossmember. For additional information, refer to [Transmission Support Crossmember](#) in this section.

2. Remove the transmission insulator and retainer bolts.



3. To install, reverse the removal procedure.
  - Tighten to 90 Nm (66 lb-ft).

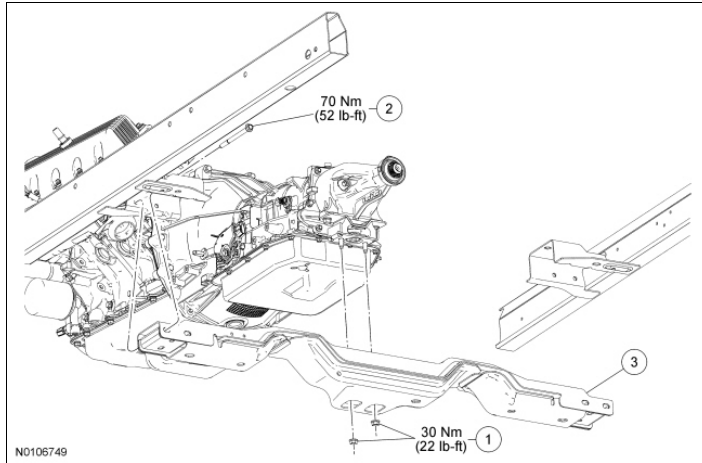


4.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Transmission Support Crossmember



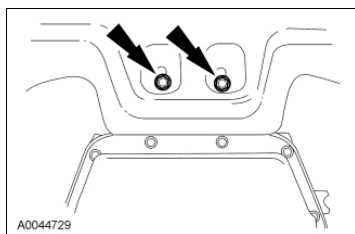
Item	Part Number	Description
1	W520514	Transmission insulator and retainer nuts
2	W709208	Transmission support crossmember bolt (4 required)
3	5027	Transmission support crossmember

### Removal

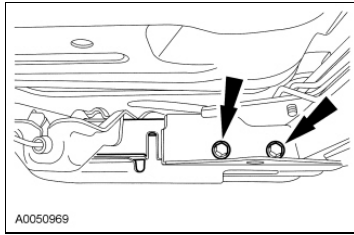
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

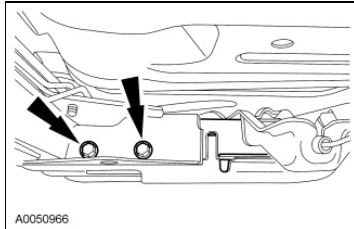
2. Remove the exhaust system. For additional information, refer to [Section 309-00](#) .
3. Remove the transmission insulator and retainer nuts.



4. Install a suitable transmission jack.
5. Remove the RH side transmission support crossmember bolts.

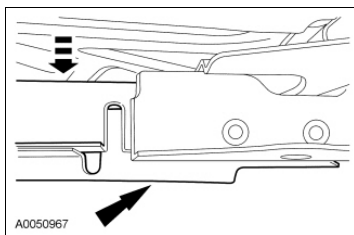


6. Remove the LH side transmission support crossmember bolts.



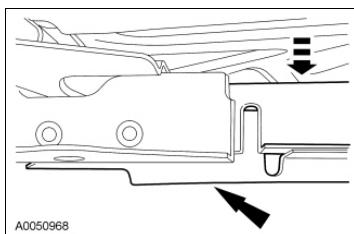
7. **NOTICE:** The transmission support crossmember is a press fit in the transmission support crossmember pocket. It may be necessary to pry the transmission support crossmember out of the transmission support crossmember pocket. Be careful not to damage the transmission support crossmember.

Lower the RH side of the transmission support crossmember.



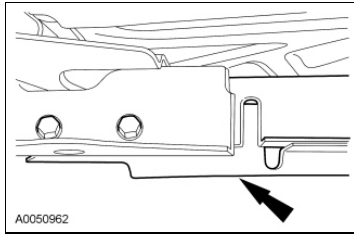
8. **NOTICE:** The transmission support crossmember is a press fit in the transmission support crossmember pocket. It may be necessary to pry the transmission support crossmember out of the transmission support crossmember pocket. Be careful not to damage the transmission support crossmember.

Lower the LH side of the transmission support crossmember and remove the transmission support crossmember.

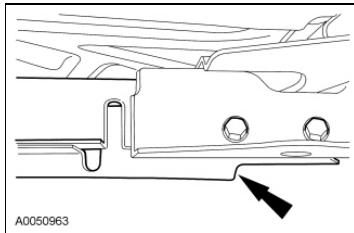


## Installation

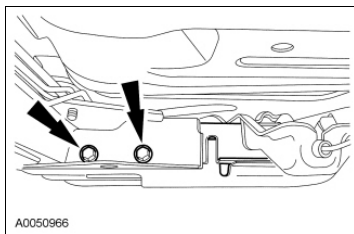
1. Position the LH side of the transmission support crossmember into the transmission support crossmember pocket and loosely install the bolts.



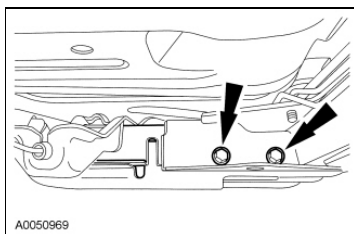
2. Position the RH side of the transmission support crossmember into the transmission support crossmember pocket and loosely install the bolts.



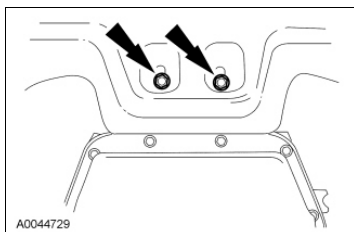
3. Tighten the LH transmission support crossmember bolts.
  - Tighten to 70 Nm (52 lb-ft).




4. Tighten the RH transmission support crossmember bolts.
  - Tighten to 70 Nm (52 lb-ft).



5. Lower the transmission onto the transmission support crossmember and install the transmission insulator and retainer nuts.
  - Tighten to 30 Nm (22 lb-ft).



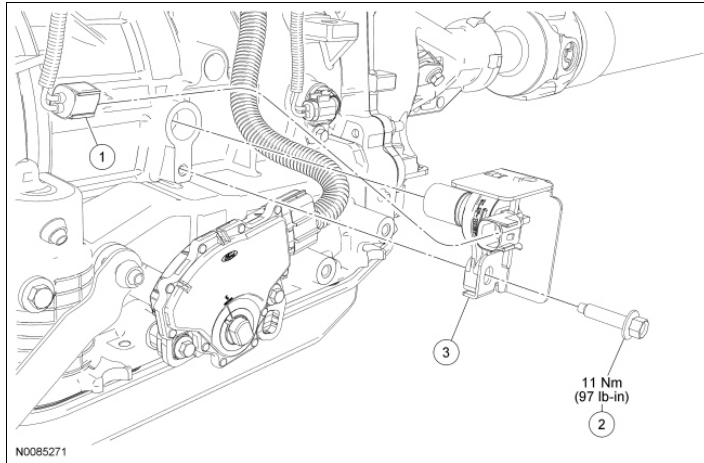
6. Remove the transmission jack.
7. Install the exhaust system. For additional information, refer to [Section 309-00](#).

8.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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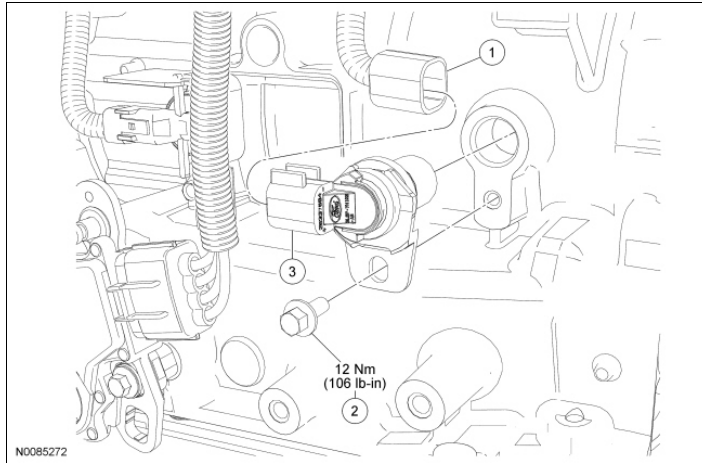
**Turbine Shaft Speed (TSS) Sensor**

Item	Part Number	Description
1	-	Turbine Shaft Speed (TSS) sensor connector
2	W700005	TSS sensor bolt
3	7M101	TSS sensor

**Removal and Installation**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
2. Disconnect the Turbine Shaft Speed (TSS) sensor connector.
3. Remove the TSS sensor bolt and the sensor.
  - To install, tighten to 11 Nm (97 lb-in).
4. To install, reverse the removal procedure.



**Output Shaft Speed (OSS) Sensor**

Item	Part Number	Description
1	-	Output Shaft Speed (OSS) sensor connector
2	N605771	OSS sensor bolt
3	7H103	OSS sensor


**Removal and Installation**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
2. Disconnect the Output Shaft Speed (OSS) sensor connector.
3. Remove the OSS sensor bolt and the sensor.
  - To install, tighten to 12 Nm (106 lb-in).
4. To install, reverse the removal procedure.



**Transmission**

## Special Tool(s)

 ST1636-A	Retainer, Torque Converter 307-346 (T97T-7902-A)
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**NOTICE:** Whenever a transmission has been disassembled to install new parts, the transmission fluid cooler tubes must be cleaned and backflushed using suitable transmission fluid cooler tube backflushing and cleaning equipment. A new transmission fluid cooler must be installed.

When internal wear or damage has occurred in the transmission, metal particles, clutch plate material or band material may have been carried into the torque converter and transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns and must be removed from the system before the transmission is put back into service.

**NOTE:** After the transmission is removed for a major overhaul, it is important to clean all transmission components, including torque converter, cooler inlet tube, main control valve body, clutches and all coasting booster valve shuttle balls after any transmission service that generates contamination. These contaminants are a major cause of recurring transmission concerns and must be removed from the system before the transmission is returned into service.

The cleaning of foreign material from the direct clutch check ball is often omitted. This omission can lead to repeat servicing of the transmission.

A new transmission fluid cooler must be installed under the following condition. For additional information, refer to Section 307-02.

- Evidence of broken transmission components or transmission fluid contamination found due to the following transmission or torque converter failure modes:
  - ◆ Major metallic failure
  - ◆ Multiple clutches or clutch plate failure
  - ◆ Sufficient component wear which results in metallic contamination

1. Disconnect the battery ground cable. For additional information, refer to Section 414-01.
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A.

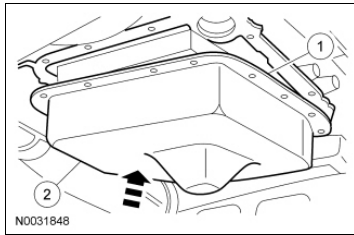
3. **NOTE:** Only if transmission disassembly or replacement is required, drain the transmission fluid. For additional information, refer to Fluid Pan, Gasket and Filter in this section.

Drain the transmission fluid.

- Loosen the transmission fluid pan bolts and allow the transmission fluid to drain.

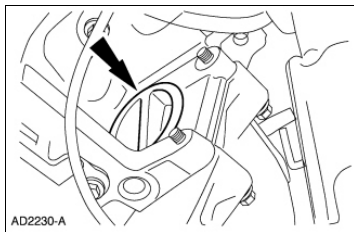
4. Install the transmission fluid pan and the old transmission fluid pan gasket.

1. Position the transmission fluid pan gasket.
2. Position the transmission fluid pan.



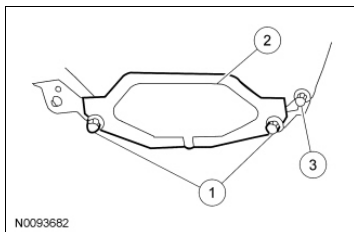
5. Remove the driveshaft. For additional information, refer to [Section 205-01](#) .

6. Remove the torque converter access cover plug at the left rear engine block.



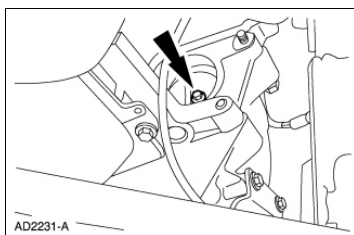
7. Remove the transmission inspection cover.

1. Remove the 2 bolts.
2. Remove the inspection cover
3. Remove the bolt for the separator plate.



8. **NOTE:** Make an identifying mark on the torque converter stud and the flexplate for correct alignment during assembly.

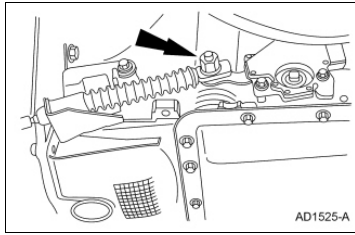
Remove and discard the 4 torque converter nuts.



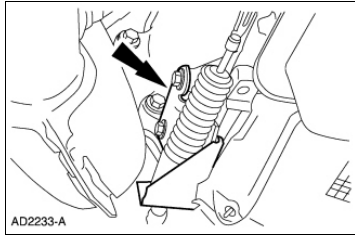
9. Remove the exhaust system. For additional information, refer to [Section 309-00](#) .

10. **NOTE:** Make a reference mark on the selector lever cable to the transmission.

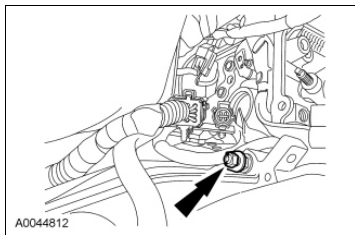
Disconnect the selector lever cable.



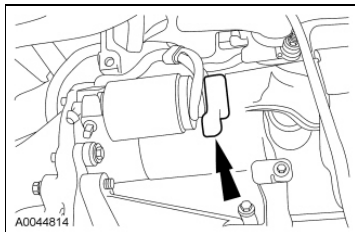
11. Remove the selector lever cable bracket and position aside.



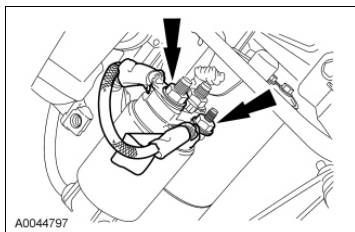
12. Remove the ground wire.



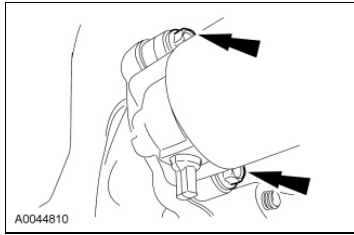
13. Remove the starter electrical connector cap.



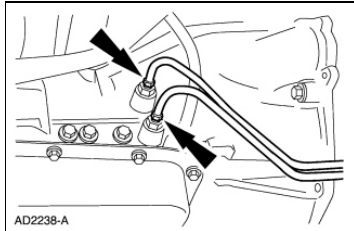
14. Disconnect the electrical connectors.



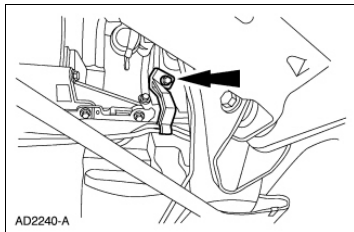
15. Remove the 3 starter bolts and the starter.



16. Remove the transmission fluid cooler tubes from the transmission.

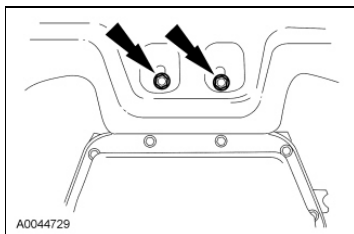


17. Remove the transmission fluid cooler tube bracket nut and position the transmission fluid cooler tubes aside.



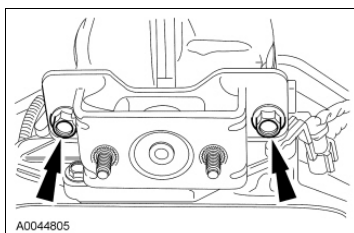
18. Position a suitable jack under the transmission. Secure the transmission to the jack with safety straps.

19. Remove the transmission insulator and retainer nuts.



20. Remove transmission support crossmember. For additional information, refer to [Transmission Support Crossmember](#) in this section.

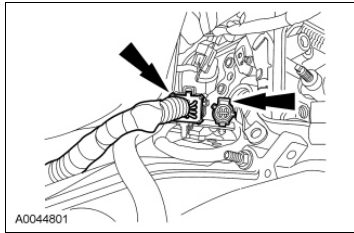
21. Remove the transmission insulator and retainer bolts.



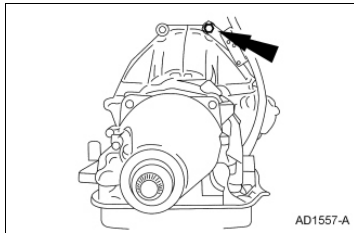
22. **NOTE:** It is not necessary to disconnect the transmission harness from all the transmission sensors at this time, the harness will come out with the transmission.



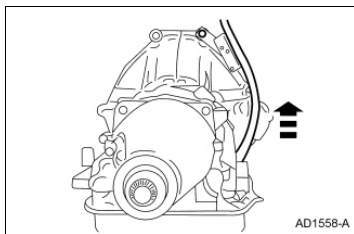
Disconnect the wire harness connectors and remove them from the transmission fluid filler tube.



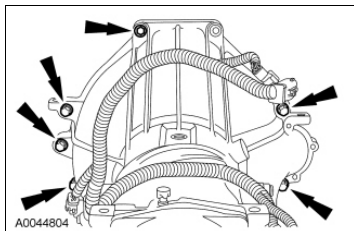
23. Remove the transmission filler tube bolt.



24. Position the transmission filler tube aside.



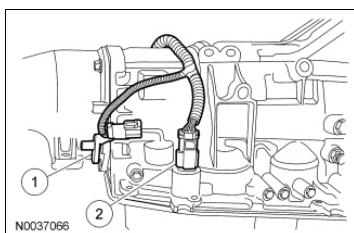
25. Remove the transmission retaining bolts.



26. Separate the transmission from the engine and lower. Partially lower the transmission from under the vehicle.

27. Disconnect the electrical connectors.

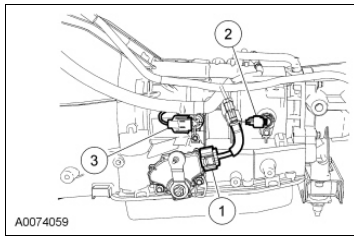
1. Remove the catalyst monitor connector retainer from the stud.
2. Disconnect the transmission vehicle harness connector.



28. Disconnect the electrical connectors and remove the wire harness from the transmission.

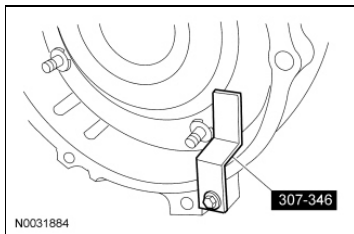
1. Disconnect the Transmission Range (TR) sensor connector.

2. Disconnect the Output Shaft Speed (OSS) sensor connector.
3. Disconnect the Turbine Shaft Speed (TSS) sensor connector.
  - Remove the catalyst monitor connector retainer from the stud.
  - Disconnect the wire harness retainers and remove the harness.



29. **⚠ WARNING:** Secure the torque converter in the transmission during removal or installation. The torque converter is heavy and may result in injury if it falls out of the transmission. Failure to follow this instruction may result in serious personal injury.

Keep the transmission in a horizontal position, slide it back far enough to install the Torque Converter Retainer. Install the Torque Converter Retainer.



30. **NOTE:** Make sure the Torque Converter Retainer is in place and the transmission is securely fastened to the transmission jack before tilting the transmission.

Lower the transmission from under the vehicle.

31. If the transmission is being disassembled to install new parts, or if a new or remanufactured transmission is being installed, the transmission fluid cooler, the auxiliary transmission fluid cooler (if equipped) and the transmission fluid cooler tubes must be cleaned and backflushed to keep contaminants from entering the transmission. For additional information, refer to Transmission Fluid Cooler Tubes Backflushing and Cleaning in this section.
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SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
DISASSEMBLY

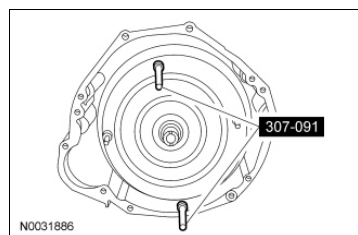
2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

## Transmission

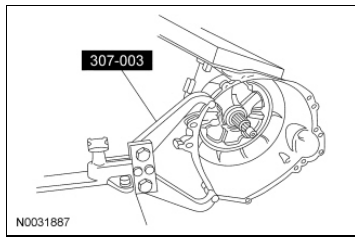
### Special Tool(s)

 ST1631-A	Handle, Torque Converter 307-091 (T81P-7902-C)
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)
 ST1200-A	Remover, Bearing Cup 308-047 (T77F-1102-A)
 ST1210-A	Remover/Installer, Servo Piston 307-251 (T92P-70023-A)
 ST1192-A	Remover, Torque Converter Fluid Seal 307-309 (T94P-77001-BH)
 ST1208-A	Remover, Transmission Fluid Pump 307-221 (T89T-70010-A)
 ST1192-A	Remover, Transmission Fluid Seal 307-048 (T74P-77248-A)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1187-A	Slide Hammer 307-005 (T59L-100-B)

1. Using the Torque Converter Handles, remove the torque converter.

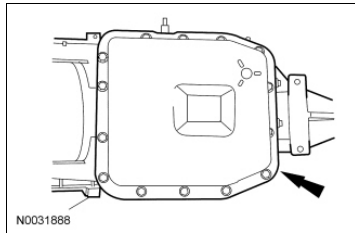


2. Using the Transmission Holding Fixture, mount the transmission to the bench.

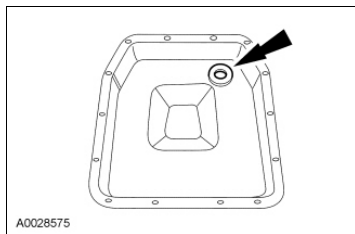


3. **NOTE:** If the transmission fluid pan gasket is not damaged, it may be reused.

Remove the bolts, transmission fluid pan and transmission fluid pan gasket.



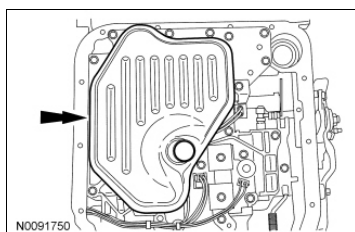
4. Clean the transmission fluid pan and pan magnet.



5. **NOTICE:** If installing a new transmission fluid filter and the grommet remains in the main control bore, carefully use a small screwdriver to remove the grommet. Use care not to damage the main control bore.

**NOTE:** If transmission is being repaired for a contamination-related failure, use a new transmission fluid filter and seal. The transmission fluid filter may be reused if no excessive contamination is present.

Remove the transmission fluid filter and grommet.

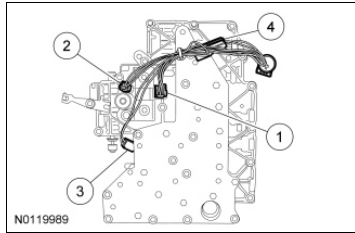


6. **NOTICE:** Carefully pry up on the locking tabs to disconnect the solenoids. Disconnect the internal transmission harness from the solenoids.

Disconnect the transmission internal harness from the solenoids.

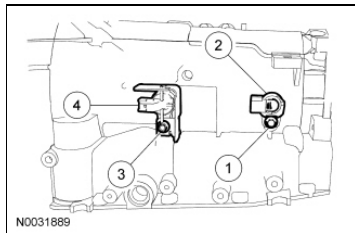
1. Disconnect Shift Solenoid A (SSA) and Shift Solenoid B (SSB).
2. Disconnect the Torque Converter Clutch (TCC).
3. Disconnect the Electronic Pressure Control (EPC) solenoid.

4. Disconnect the Transmission Fluid Temperature (TFT) sensor.



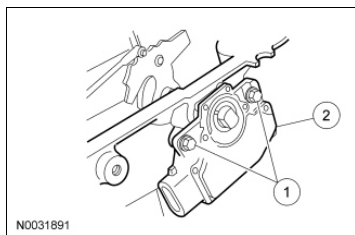
7. Remove the Output Shaft Speed (OSS) sensor and the Turbine Shaft Speed (TSS) sensor.

1. Remove the OSS sensor bolt.
2. Remove the OSS sensor.
3. Remove the TSS sensor bolt.
4. Remove the TSS sensor.



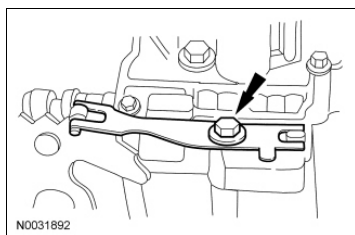
8. Remove the Transmission Range (TR) sensor.

1. Remove the bolts.
2. Remove the TR sensor.

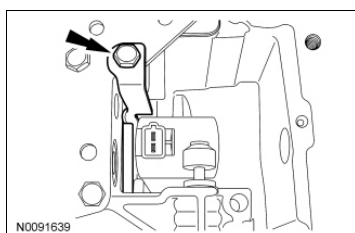


9. Remove the manual control valve detent lever spring.

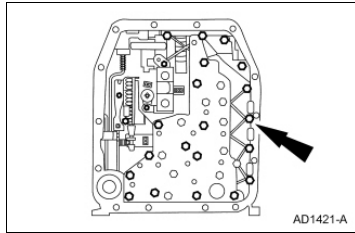
- Remove the bolt.



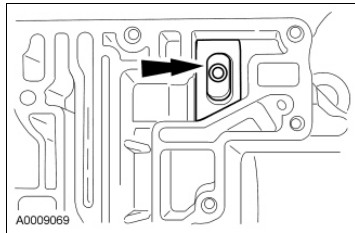
10. Remove the bolt and the EPC solenoid bracket.



11. Remove the 23 main control valve body bolts and the main control valve body.

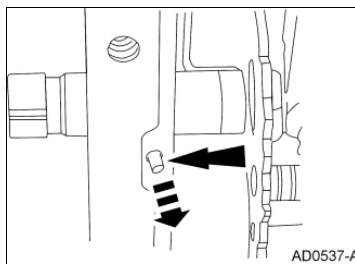


12. Remove and discard the pump outlet screen.



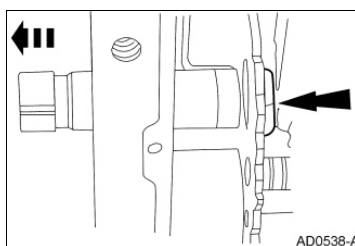
13. **NOTE:** Use a shop cloth to protect the transmission case surface.

Remove the manual control lever shaft retaining pin.

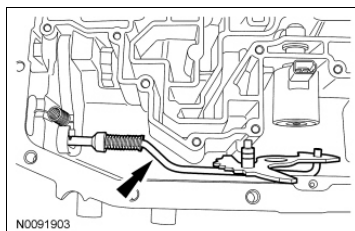


14. Remove the manual control lever shaft inner nut.

- Slide the manual control lever shaft out of the case while removing the inner nut.

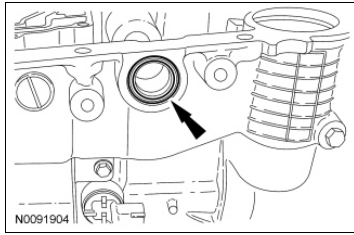


15. Remove the manual control lever valve detent lever and the parking lever actuating rod assembly.

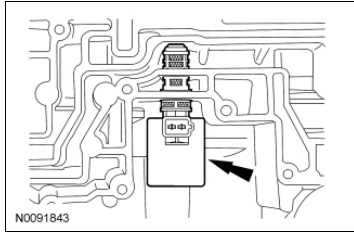


16. **NOTICE:** Use care not to damage the manual control lever shaft bore. If the bore is damaged, the new seal may leak.

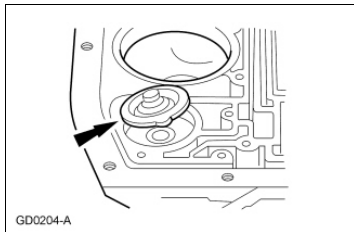
Remove the manual control lever shaft seal.



17. Remove the EPC solenoid.

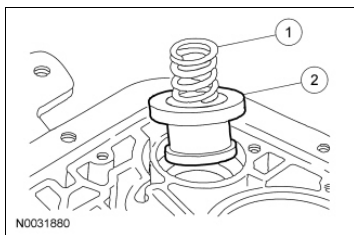


18. Remove the 2-3 accumulator spring retainer.



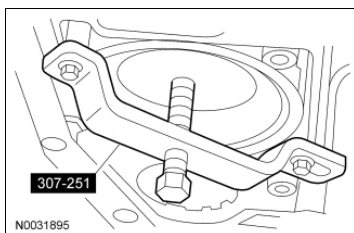
19. Remove the 2-3 accumulator piston.

1. Remove the 2-3 accumulator spring.
2. Remove the 2-3 accumulator piston.



20. **NOTE:** If Servo Piston Remover/Installer is not available, extreme care must be taken. Spring pressure will force overdrive servo piston assembly out of case. Case bore damage may result from trying to pry on internal retaining ring.

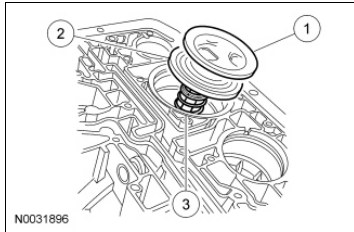
Using the Servo Piston Remover/Installer, remove the reverse band servo retaining ring.



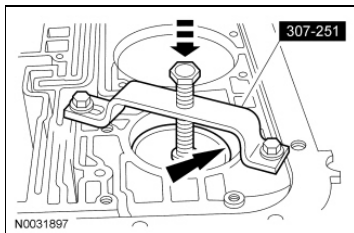
21. Remove the reverse servo assembly.



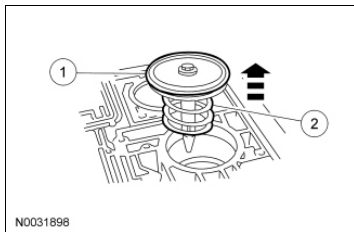
1. Remove the reverse band servo cover.
2. Remove the reverse band servo piston and rod.
3. Remove the reverse band servo spring.



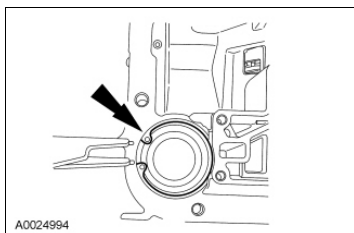
22. Using the Servo Piston Remover/Installer, compress the piston spring, then remove the overdrive servo piston retainer.



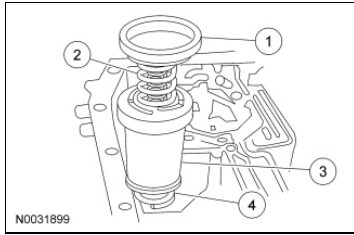
23. Remove the overdrive servo piston.
  1. Remove the overdrive servo piston.
  2. Remove the overdrive servo piston return spring.



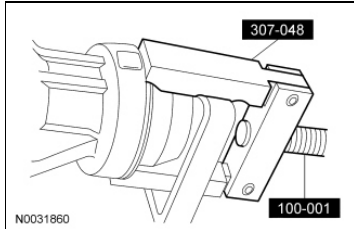
24. Compress the 1-2 accumulator cover and remove the retaining ring.



25. Remove the 1-2 accumulator upper spring.
  1. Remove the 1-2 accumulator spring cover.
  2. Remove the inner and outer lower 1-2 accumulator spring.
  3. Remove the 1-2 accumulator.
  4. Remove the 1-2 accumulator upper spring.



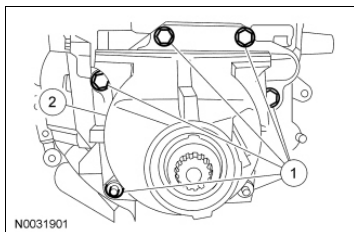
26. Using the Transmission Fluid Seal Remover and Slide Hammer, remove the extension housing seal.



27. **NOTE:** These bolts have been coated with a sealant. High break torque may be required to remove these bolts.

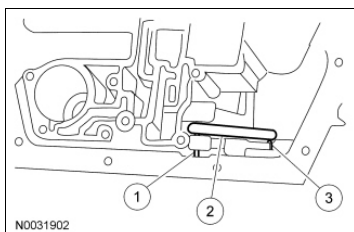
Remove the extension housing.

1. Remove the 4 bolts and 2 nuts.
2. Remove the extension housing and the extension housing gasket.



28. Remove the parking pawl.

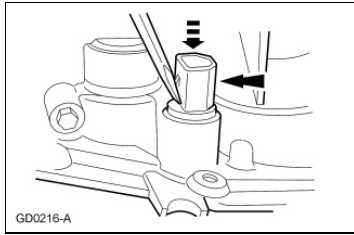
1. Remove the parking pawl shaft.
2. Remove the parking pawl return spring.
3. Remove the parking pawl.



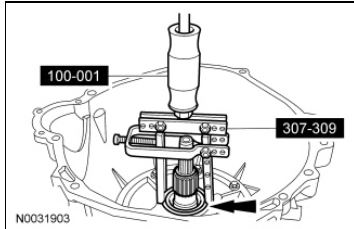
29. Rotate the transmission to the vertical position with the output shaft toward the floor.

30. **NOTICE:** Extreme care must be taken during transmission internal harness connector removal. Do not use a hammer on the connector body or damage may occur to the connector.

Place a screwdriver on the flat portion of the transmission internal harness connector and push the transmission internal harness connector out through the bottom of the case.

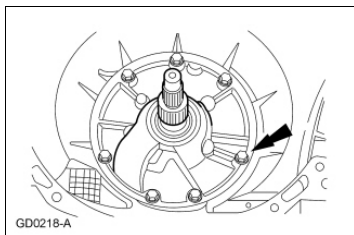


31. Using the Torque Converter Fluid Seal Remover and Slide Hammer, remove the front pump seal.

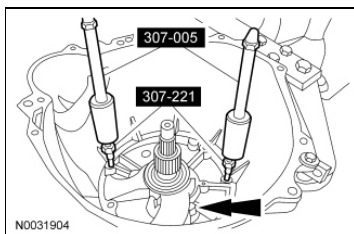


32. **NOTE:** These bolts have been coated with sealant. High break torque may be required to remove the bolts.

Remove the front pump support bolts.



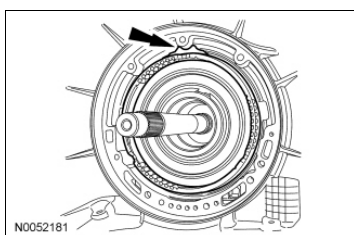
33. Using the Transmission Fluid Pump Remover and Slide Hammer, remove the front pump support.



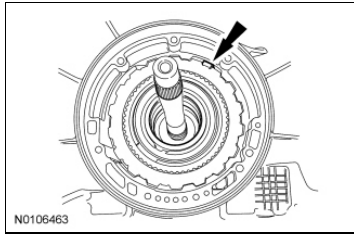
34. Remove and discard the front pump support gasket.

35. **NOTE:** For assembly, note the location of the check ball and the intermediate clutch piston return spring pack indent during disassembly.

Remove the intermediate clutch piston return spring pack.



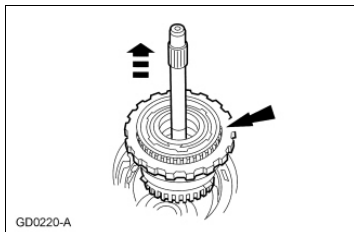
36. Remove the intermediate clutch anti-rattle clip, if equipped.



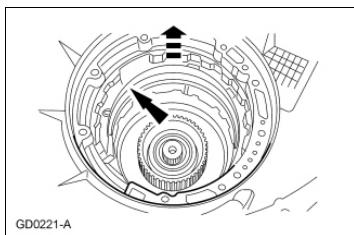
**37. NOTICE:** Remove the assembly carefully to prevent damage to the overdrive band friction material by the reverse clutch drive lugs.

Remove the following components as an assembly:

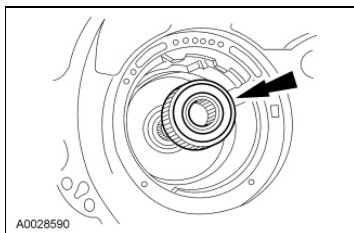
- Intermediate clutch pack
- Intermediate One-Way Clutch (OWC)
- Reverse clutch
- Forward clutch assembly



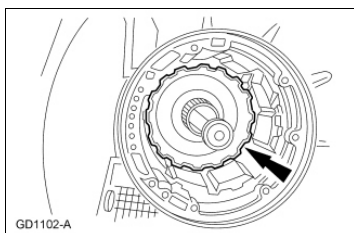
**38.** Disengage and remove the overdrive band.



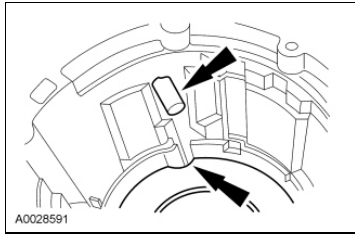
**39.** Remove the forward clutch hub and the No. 3 forward clutch hub front bearing.



**40.** Remove the intermediate stub shaft.

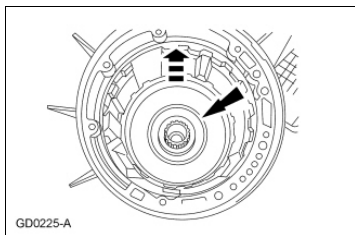


**41.** Align the reverse sun shell with the overdrive band anchor pin for removal.

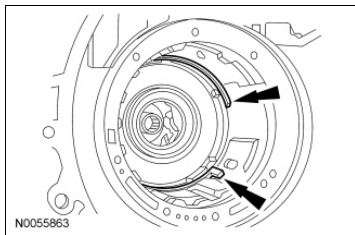


42. Remove the following components as an assembly:

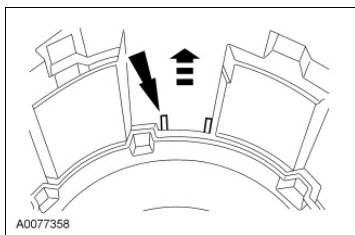
- Forward clutch sun gear
- No. 5 forward clutch sun gear bearing and race
- Reverse clutch sun gear
- No. 4 forward clutch hub bearing



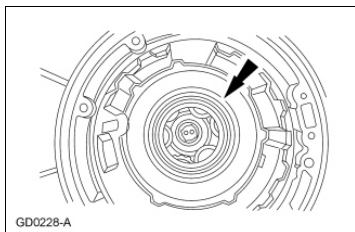
43. Remove the center support retaining ring and note location for assembly.



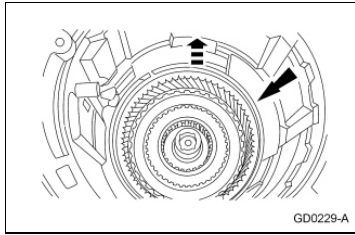
44. Remove the case-to-center support spring.



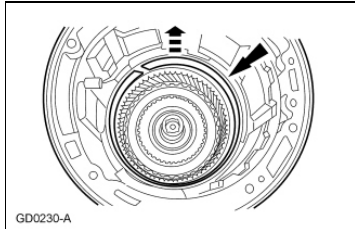
45. Remove the planetary center support and planetary as an assembly.



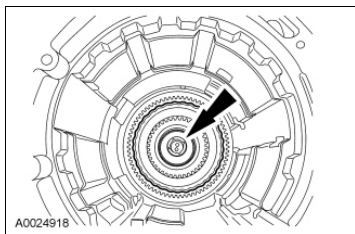
46. Remove the reverse clutch band.



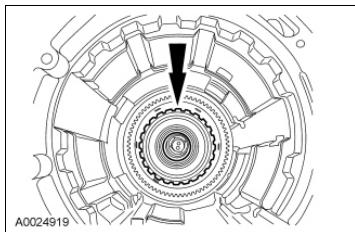
47. Remove the retaining ring.



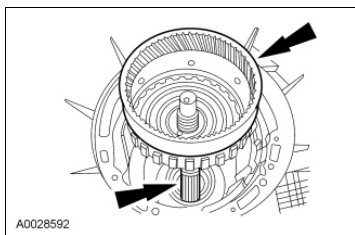
48. Remove the direct clutch pack, No. 7 bearing and support.



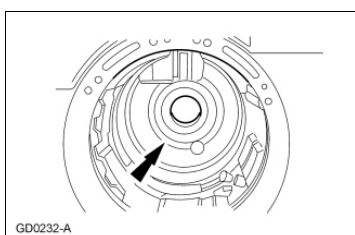
49. Remove the No. 8 bearing.



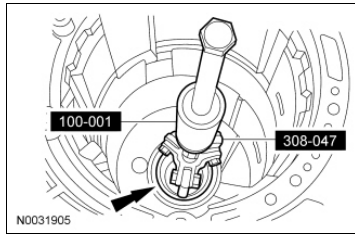
50. Remove the output shaft and output shaft ring gear assembly.



51. Remove the No. 9 case rear bearing.

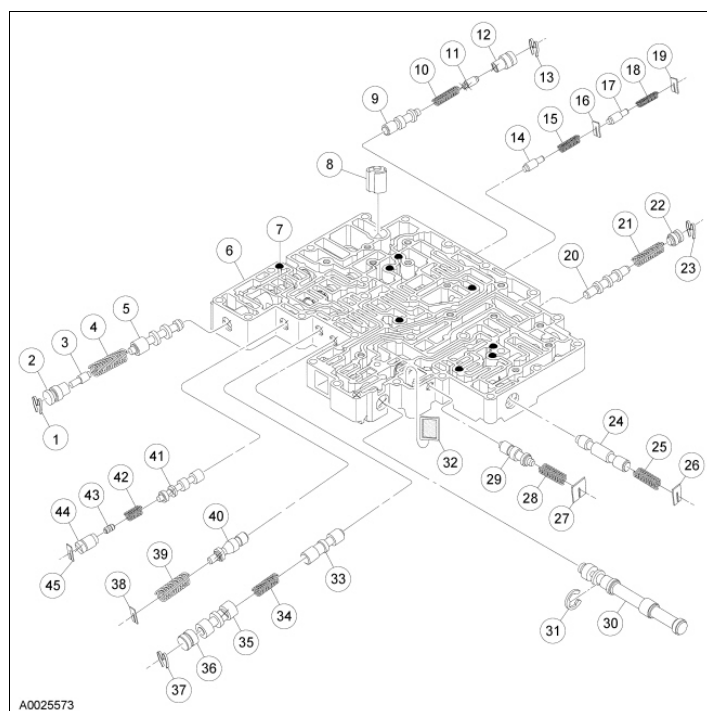


52. Inspect and, if necessary, use the Bearing Cup Remover and Slide Hammer to remove the rear case bushing.



SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E2010 Crown Victoria, Grand Marquis  
Workshop ManualDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

Procedure revision date: 08/19/2009

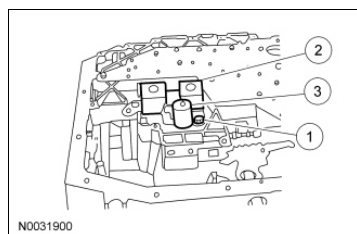
**Main Control Valve Body****Disassembly****Main Control Valve Body - Disassembled View**

Item	Part Number	Description
1	-	Valve plug retainer (part of 7A100)
2	-	Main pressure booster valve sleeve (part of 7A100)
3	-	Main pressure booster valve (part of 7A100)
4	-	Main pressure regulator valve spring (part of 7A100)
5	-	Main regulator valve (part of 7A100)
6	7A100	Main control valve body assembly
7	7E195	Check ball (8 required)
8	7H171	Converter drain back valve
9	-	Overdrive (O/D) servo regulator valve (part of 7A100)
10	-	O/D servo regulator valve spring (part of 7A100)
11	-	O/D servo regulator boost plunger (part of 7A100)
12	-	O/D servo regulator boost sleeve (part of 7A100)
13	-	Valve retainer (part of 7A100)
14	-	Capacity modulator valve (part of 7A100)
15	-	Capacity modulator valve spring (part of 7A100)
16	-	Spring retaining plate (part of 7A100)
17	-	Capacity modulator valve (part of 7A100)

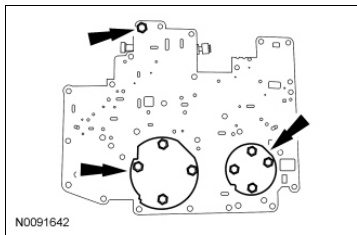


18	-	Capacity modulator valve spring (part of 7A100)
19	-	Spring retaining plate (part of 7A100)
20	-	3-4 shift valve (part of 7A100)
21	-	3-4 shift valve spring (part of 7A100)
22	-	Valve retainer plug (part of 7A100)
23	-	Valve plug retainer (part of 7A100)
24	-	2-3 backout valve (part of 7A100)
25	-	2-3 backout valve spring (part of 7A100)
26	-	Spring retaining plate (part of 7A100)
27	-	Spring retaining plate (part of 7A100)
28	-	Pressure regulator valve spring (part of 7A100)
29	-	Pressure regulator valve (part of 7A100)
30	-	Control manual valve (part of 7A100)
31	-	Retaining ring (part of 7A100)
32	7H187	Solenoid screen
33	-	1-2 shift valve (part of 7A100)
34	-	2-3 shift valve spring (part of 7A100)
35	-	2-3 valve (part of 7A100)
36	-	Valve retaining plug (part of 7A100)
37	-	Valve plug retainer (part of 7A100)
38	-	Spring retaining plate (part of 7A100)
39	-	Pressure regulator valve spring (part of 7A100)
40	-	Pressure regulator valve (part of 7A100)
41	-	Bypass clutch control valve (part of 7A100)
42	-	Bypass clutch control valve spring (part of 7A100)
43	-	Bypass clutch control valve plunger (part of 7A100)
44	-	Bypass clutch control plunger sleeve (part of 7A100)
45	-	Control valve plate (part of 7A100)

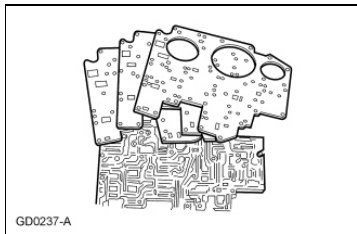
1. Remove the Torque Converter Clutch (TCC) solenoid and the shift solenoid.
  1. Remove the bolt.
  2. Remove the shift solenoid.
  3. Remove the TCC solenoid.



2. Remove the 9 bolts and the 2 valve body reinforcement plates.

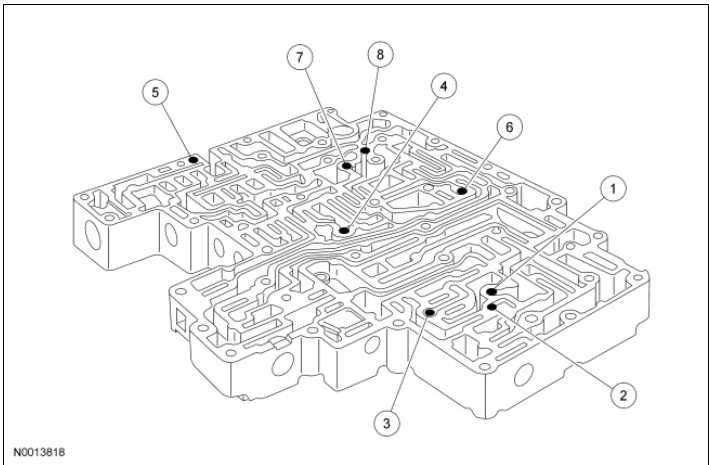


3. Remove the separator plate and discard the gaskets.



4. **NOTE:** Note the location of the 8 coasting booster valve shuttle balls for assembly.

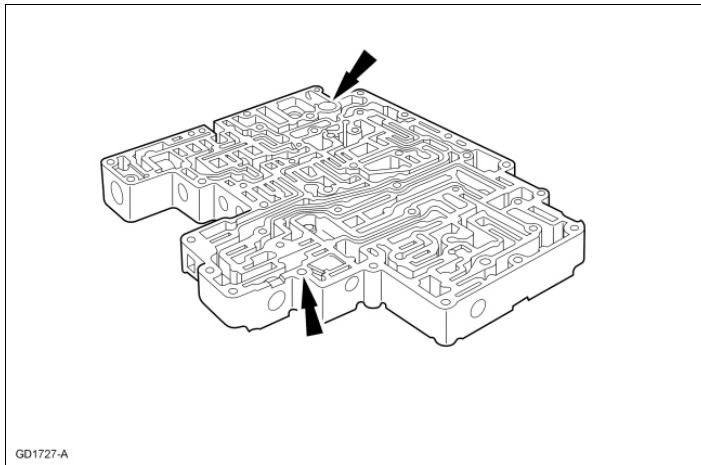
Remove the 8 coasting booster valve shuttle balls.



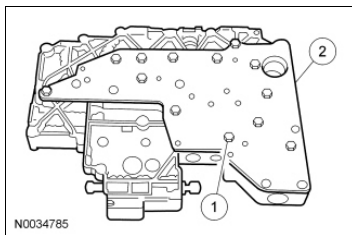
Item	Part Number	Description
1	7E195	Check ball (B9) located in the forward clutch circuit near the 3-4 shift valve and the 2-3 BP circuit
2	7E195	Check ball (B2) located in the direct clutch circuit near the 3-4 shift valve
3	7E195	Check ball (B3) located in the direct clutch circuit near the 2-3 backout valve
4	7E195	Check ball (B4) located in the Overdrive (O/D) and forward clutch circuit near the 1-2 shift valve
5	7E195	Check ball (B5) located in the reverse circuit near orifice 1
6	7E195	Check ball (B6) located between the reverse, LS modulator and the low reverse servo circuit
7	7E195	Check ball (B7) located between the L, 2, 3, 4 and the Torque Converter Clutch (TCC) circuits
8	7E195	

	Check ball (B8) located between the L, 2, 3, 4 and the intermediate clutch circuits
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5. Remove the converter drain back valve and solenoid pressure supply screen.

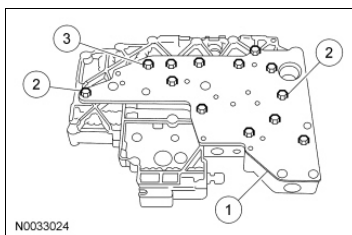


6. Remove the main control valve body cover plate.
  1. Remove the 13 bolts.
  2. Remove the valve body cover plate and gasket.

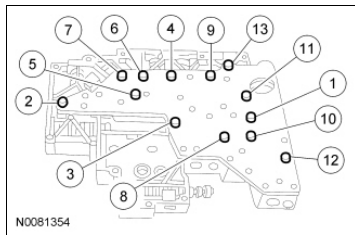


## Assembly

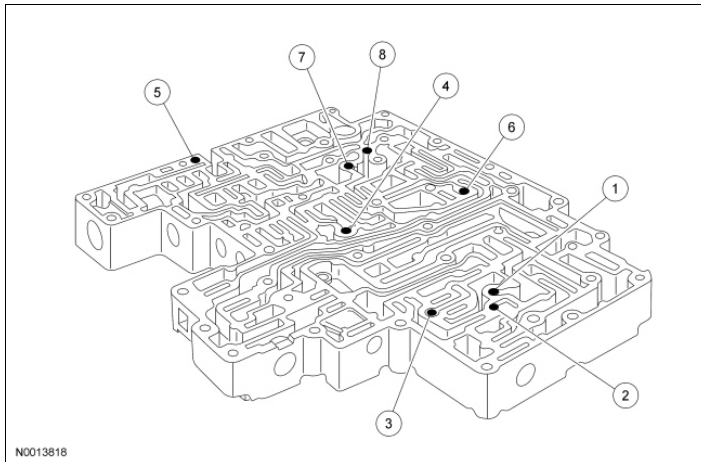
1. Install the valve body cover plate.
  1. Position the valve body cover plate gasket and cover plate.
  2. Loosely install the 2 guide pin bolts.
  3. Loosely install the bolts.



2. Tighten the bolts in the sequence shown.
  - Tighten to 10 Nm (89 lb-in).

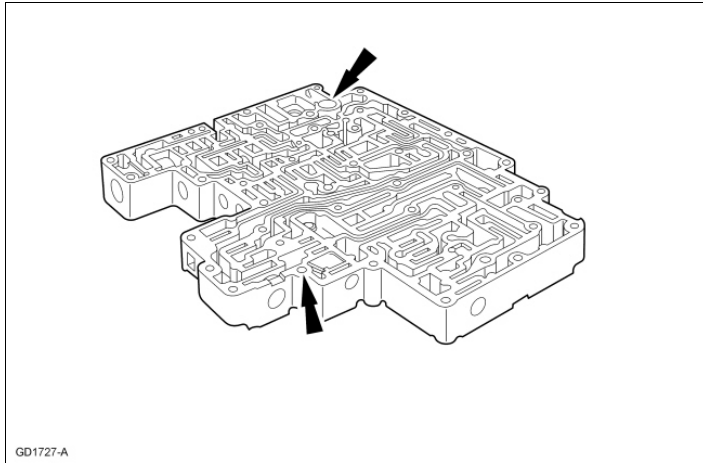


3. Install the 8 coasting booster valve shuttle balls.

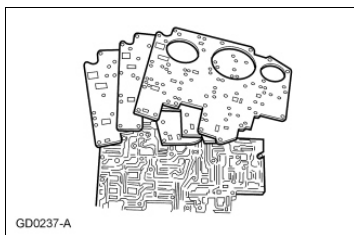


Item	Part Number	Description
1	7E195	Check ball (B9) located in the forward clutch circuit near the 3-4 shift valve and the 2-3 BP circuit
2	7E195	Check ball (B2) located in the direct clutch circuit near the 3-4 shift valve
3	7E195	Check ball (B3) located in the direct clutch circuit near the 2-3 backout valve
4	7E195	Check ball (B4) located in the Overdrive (O/D) and forward clutch circuit near the 1-2 shift valve
5	7E195	Check ball (B5) located in the reverse circuit near orifice 1
6	7E195	Check ball (B6) located between the reverse, LS modulator and the low reverse servo circuit
7	7E195	Check ball (B7) located between the L, 2, 3, 4 and the Torque Converter Clutch (TCC) circuits
8	7E195	Check ball (B8) located between the L, 2, 3, 4 and the intermediate clutch circuits

4. Install the converter drain back valve and solenoid pressure supply screen.

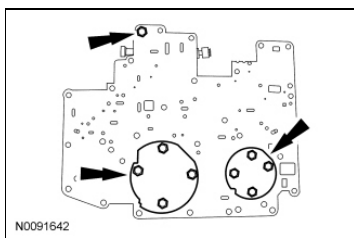


5. Install the separator plate and gaskets.



6. Install the 2 valve body reinforcement plates and the 9 bolts.

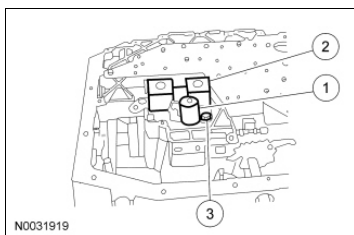
- Tighten to 10 Nm (89 lb-in).



7. **NOTE:** Inspect the shift solenoid O-rings and TCC solenoid O-rings for damage.

Install the shift solenoid.

1. Position the TCC solenoid.
  2. Position the shift solenoid.
  3. Install the bolt.
- ◆ Tighten to 10 Nm (89 lb-in).






SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
DISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

2010 Crown Victoria, Grand Marquis  
Workshop Manual

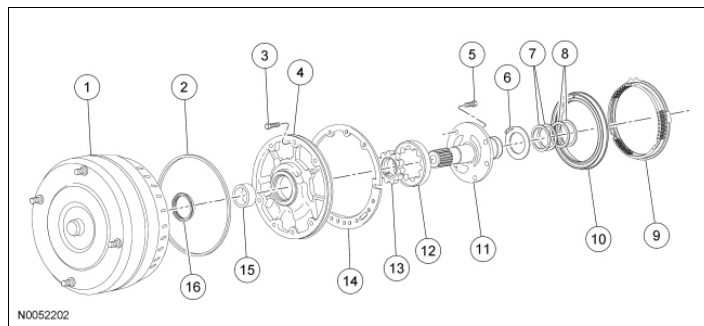
Procedure revision date: 08/19/2009

## Pump and Intermediate Clutch Piston

### Special Tool(s)

 ST1189-A	Installer, Front Pump Fluid Seal 307-014 (T63L-77837-A)
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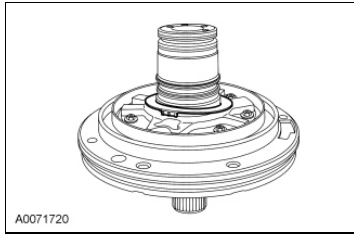
### Pump and Intermediate Clutch Spring and Support - Disassembled View



Item	Part Number	Description
1	7902	Torque converter
2	7A248	Front pump O-ring
3	N605789-S101	Bolt
4	-	Pump body assembly
5	N605787-S1000	Front pump support bolt
6	7D014	No. 1 pump support thrust washer
7	7D020	Reverse clutch cylinder seals
8	7D019	Forward clutch cylinder seals
9	7F222	Intermediate clutch piston return spring
10	7E005	Intermediate clutch piston
11	7A108	Pump support
12	-	Pump outer gerotor gear
13	-	Pump inner gerotor gear
14	7A136	Pump gasket
15	-	Pump bushing
16	7A248	Pump inner seal

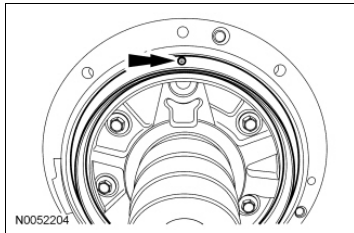
### Disassembly

1. Remove the No. 1 selective pump support thrust washer.

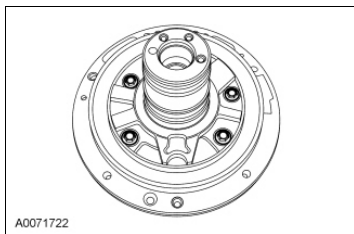


2. **NOTE:** Note the location of the check ball during disassembly for assembly.

Remove the intermediate clutch piston.

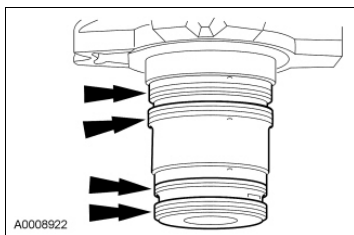


3. Remove the bolts and remove the front pump support.

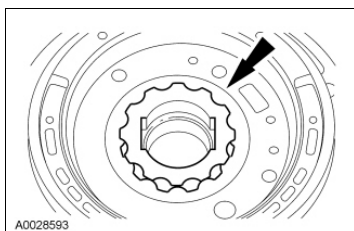


4. **NOTE:** Note that the new seals on this pump are square cut on the ends.

Remove the seal rings.

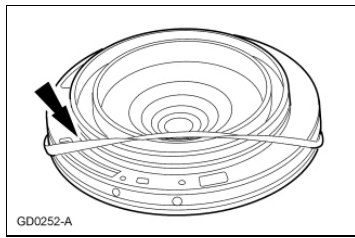


5. Remove the inner and outer pump gerotor gears.



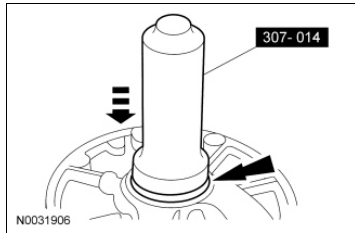
6. Remove and discard the front pump seal.





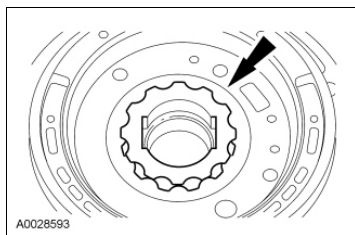
### Assembly

1. Using the Front Pump Fluid Seal Installer, install the front pump seal assembly.



2. **NOTICE:** The flats on the inner pump gear have steps that must face the pump body or damage will result.

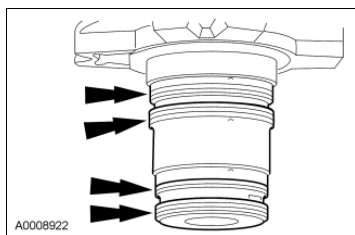
Install the inner and outer pump gerotor gears.



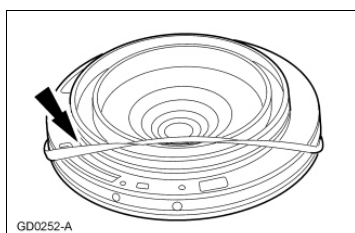
3. **NOTE:** The reverse clutch cylinder seal rings are larger than the forward clutch cylinder seals.

**NOTE:** Note that the new seals are square cut on the ends.

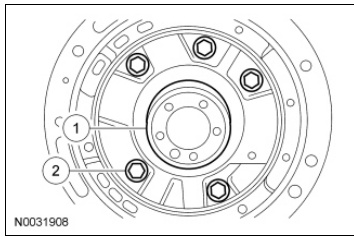
Install the seal rings.



4. Install a new front pump seal.



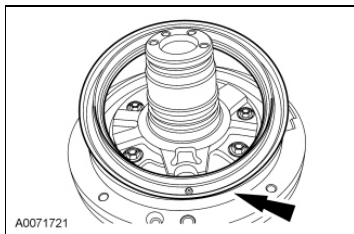
5. Assemble the front pump.
  1. Position the pump support to the pump body assembly.
  2. Install the front pump support bolts.
    - ◆ Tighten to 23 Nm (17 lb-ft).



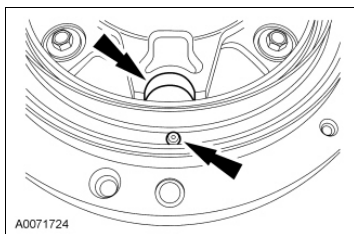
6. **NOTICE:** The piston check ball must be aligned with the half moon shape in the stator support. Shift problems may occur if installed incorrectly.

**NOTE:** The piston check ball is the only round hole in the intermediate clutch piston.

Install the intermediate clutch piston.



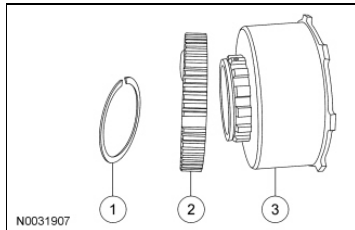
7. Once the intermediate clutch piston is installed correctly, the check ball will be aligned with the stator support body as shown.





SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E2010 Crown Victoria, Grand Marquis  
Workshop ManualDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

Procedure revision date: 08/19/2009

**Intermediate One-Way Clutch****Intermediate Clutch Cylinder Disassembled View**

Item	Part Number	Description
1	391267-S	Retaining ring (inner)
2	7A089	Intermediate one-way rocker clutch assembly
3	7D044	Reverse clutch drum

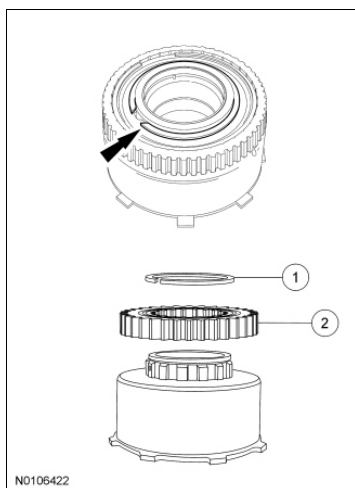
**Disassembly**

1. **NOTE:** One tab that locks the reverse clutch drum into the reverse sun shell may be removed. This is done for balancing purposes.

**NOTE:** If the retaining ring shows signs of distortion or expansion, replace the intermediate one-way rocker clutch and retaining ring.

Remove the intermediate one-way rocker clutch.

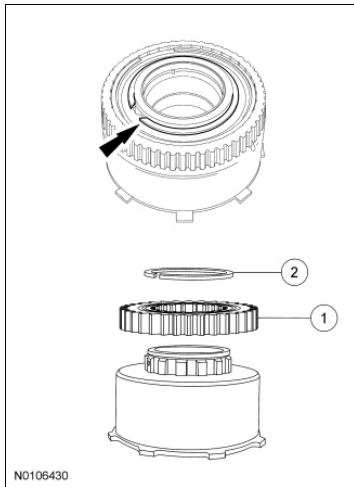
1. Remove the inner retaining ring.
2. Remove the intermediate one-way rocker clutch.

**Assembly**

1. **NOTE:** The intermediate one-way rocker clutch must rotate counterclockwise when installed on the reverse clutch drum and will make a ratchet sound.

Install the intermediate one-way rocker clutch.

1. Install the intermediate one-way rocker clutch.
2. Install the inner retaining ring.








SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
DISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

## Reverse Clutch

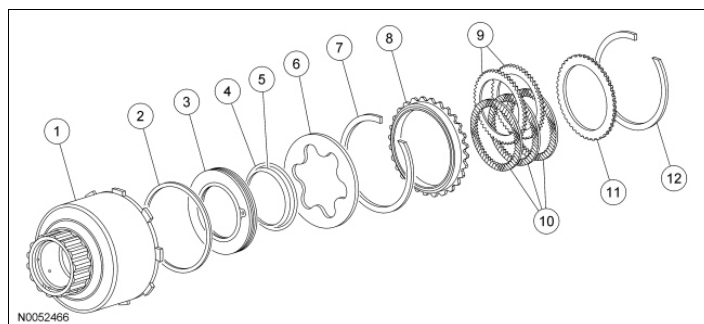
### Special Tool(s)

	Compressor, Clutch Spring 307-015 (T65L-77515-A)
	Compressor, Clutch Spring 307-086 (T80L-77405-A)
	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)
	Protector, Transmission Reverse Clutch Inner Fluid Seal 307-425
	Protector, Transmission Reverse Clutch Outer Fluid Seal 307-424

### Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

### Reverse Clutch Disassembled View

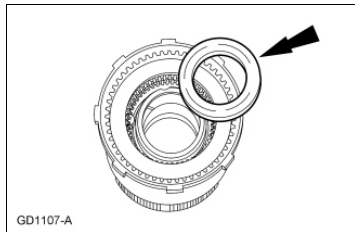


Item	Part Number	Description
1	7D044	Reverse clutch drum
2	7D403	Reverse clutch piston outer seal
3	7D402	Reverse clutch piston

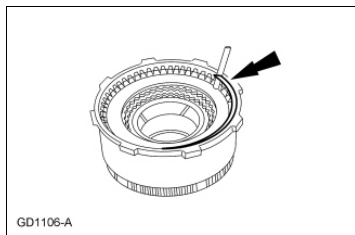
4	7D404	Reverse clutch piston inner seal
5	7D256	Reverse clutch piston spring pressure ring
6	7B070	Reverse clutch piston spring
7	7A577	Reverse clutch piston spring ring
8	7B066	Reverse clutch front pressure plate
9	7B442	Reverse clutch external spline plates (steel)
10	7B164	Reverse clutch internal spline plates (friction)
11	7B066	Reverse clutch rear pressure plate
12	7D483	Reverse clutch retaining ring (select fit)

### Disassembly

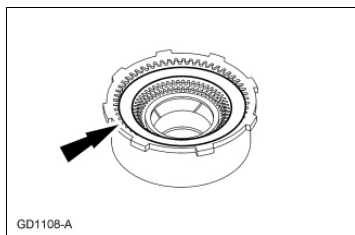
1. Remove the No. 2 forward clutch bearing.



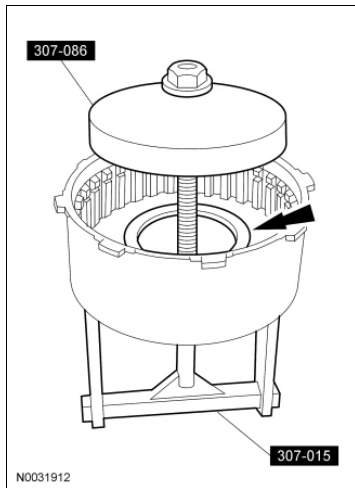
2. Remove the reverse clutch select fit retaining ring.



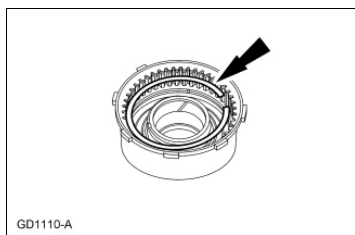
3. Remove the reverse clutch pack.



4. Using the Clutch Spring Compressor tools, compress the reverse clutch piston spring.

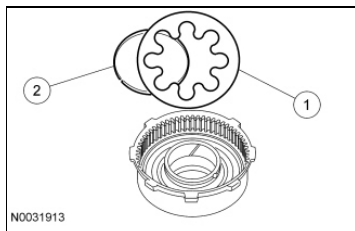


5. Remove the reverse clutch piston spring retaining ring.



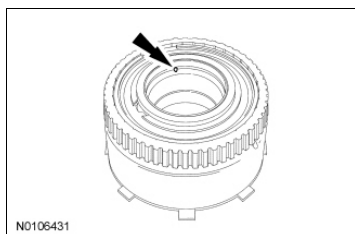
6. Remove the reverse clutch piston spring pressure ring.

1. Remove the reverse clutch piston spring.
2. Remove the reverse clutch piston spring pressure ring.



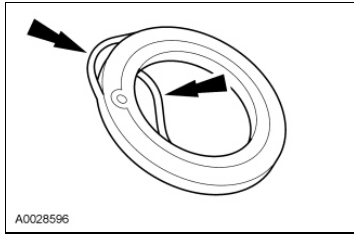
7. **NOTE:** To ease reverse clutch piston removal, it may be necessary to apply air pressure to the reverse clutch drum. Block the opposite hole.

Remove the reverse clutch piston.



8. Remove the reverse clutch piston inner and outer seals.





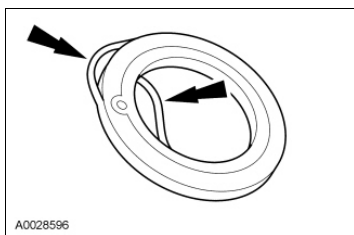
## Assembly

1. **NOTE:** One tab that locks the reverse clutch drum into the reverse sun shell may be removed. This is done for balancing purposes.

Inspect the clutch cylinder thrust surfaces, piston bore and clutch plate serrations for scores or burrs. Minor scores or burrs may be removed with crocus cloth. Install a new clutch cylinder if badly scored or damaged.

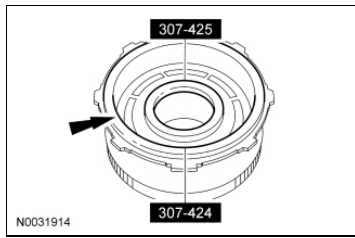
2. Check the transmission fluid passage in the clutch cylinder for obstructions. Clean out all transmission fluid passages. Inspect clutch piston for scores and install new if necessary. Inspect the check balls for freedom of movement and correct seating.
3. Check the clutch release spring for distortion and cracks. Install a new spring (including wave spring) if distorted or cracked.
4. Inspect the composition clutch plates, steel clutch plates and clutch pressure plate for worn or scored bearing surfaces. Install new parts if they are deeply scored or burred.
5. Check the clutch plates for flatness and fit on the clutch hub serrations. Discard any plate that does not slide freely on serrations or that is not flat.
6. Check the clutch hub thrust surfaces for scores and clutch hub splines for wear.
7. **NOTE:** The piston check ball must be present and moving freely.

Install a new reverse clutch piston inner and outer seals.



8. **NOTE:** Coat the reverse clutch piston inner seal, outer seal, drum sealing area and special tools with petroleum jelly.

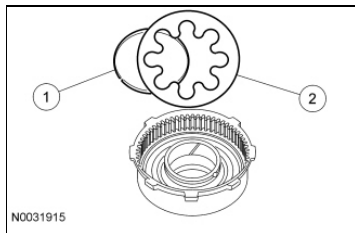
Using the Transmission Reverse Clutch Inner Fluid Seal Protector and the Transmission Reverse Clutch Outer Fluid Seal Protector, install the reverse clutch piston using even pressure to push it to the bottom of the reverse clutch drum.



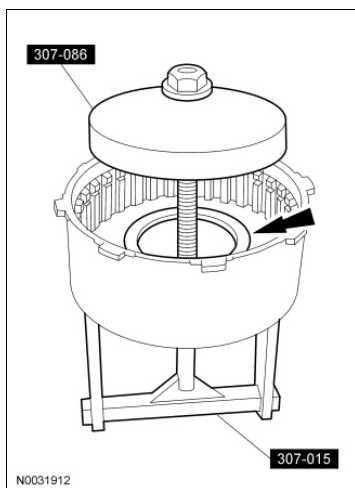
9. **NOTE:** The dished side of the reverse clutch piston spring must face the reverse clutch piston.

Install the reverse clutch piston spring.

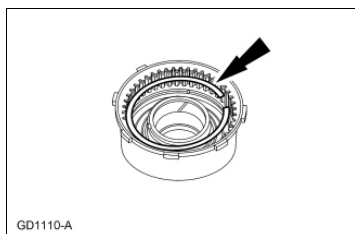
1. Install the reverse clutch piston spring pressure ring.
2. Install the reverse clutch piston spring.



10. Using the Clutch Spring Compressor tools, compress the reverse clutch piston spring.



11. Install the reverse clutch piston wave spring retaining ring with the points down.

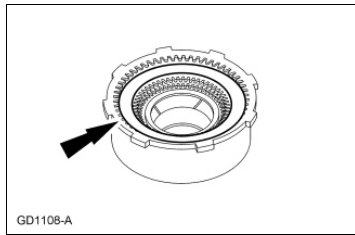


12. Remove the Clutch Spring Compressor.

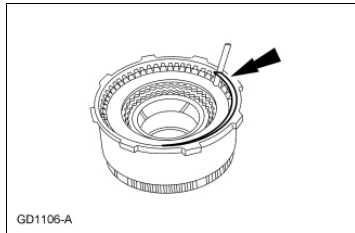
13. **NOTICE:** Install the pressure plates with the flat sides facing the clutch pack or damage may occur to the clutch pack.

**NOTE:** Before assembly, soak the new clutch discs in transmission fluid.

Install the reverse clutch front pressure plate, clutch pack and reverse clutch rear pressure plate.

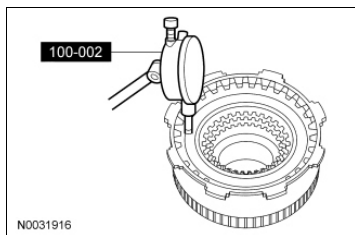


14. Install the reverse clutch pressure plate retainer snap ring.



15. Install the Dial Indicator Gauge with Holding Fixture on the reverse clutch pack.

- Push downward on the clutch pack.
- Release pressure and zero the Dial Indicator Gauge.

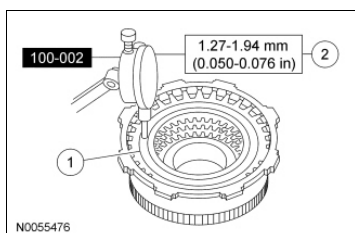


16. Using the Dial Indicator Gauge with Holding Fixture, check the reverse clutch pack clearance.

1. Lift up on the clutch pack until it fully seats against the reverse clutch pressure plate retainer.
2. Read the Dial Indicator Gauge.
  - ♦ If clearance is not within specifications, install the correct size retaining ring.

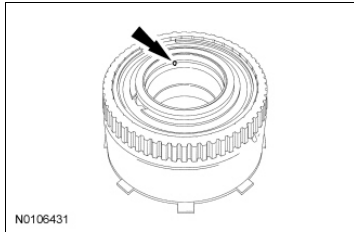
### Selective Retaining Rings

Specification
1.52-1.63 mm (0.059-0.064 in)
1.88-1.98 mm (0.074-0.077 in)
2.24-2.34 mm (0.088-0.092 in)
2.59-2.69 mm (0.101-0.105 in)



17. Check the clutch for correct operation.

- Apply air pressure to the reverse clutch drum. The clutch should be heard and felt to work without leakage.


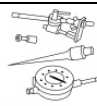




SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75EDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

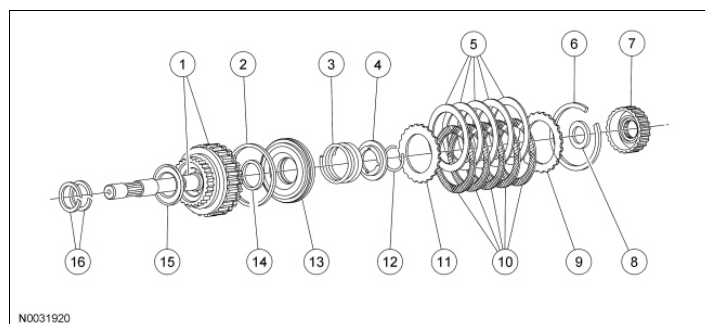
**Forward Clutch Cylinder**

## Special Tool(s)

	Compressor, Clutch Spring 307-096 (T81P-70235-A)
	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C) or equivalent
	Protector, Piston Seal 307-020 (T68P-7D158-A2)
	Protector, Piston Seal 307-078 (T80L-77140-A)

## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

**Forward Clutch - Disassembled View**

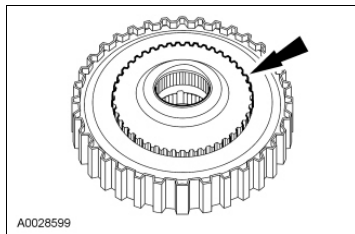
Item	Part Number	Description
1	7F207	Forward clutch cylinder and shaft
2	7A548	Forward clutch piston outer seal
3	7A480	Forward clutch piston return spring
4	7A527	Forward clutch retainer return spring
5	7B442	Forward clutch external spline plates (steel)
6	7D483	Retaining snap ring

7	7B067	Forward clutch hub
8	7F231	No. 3 forward clutch hub front bearing
9	7B066	Forward clutch pressure plate
10	7B164	Forward clutch internal spline plates (friction)
11	7E085	Forward clutch pressure spring
12	388099-S	Retaining snap ring
13	7A262	Forward clutch piston
14	7C099	Forward clutch piston inner seal
15	7A166	No. 2 forward clutch bearing
16	7B497	Input shaft seals

### Disassembly

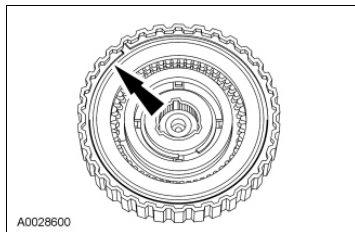
1. **NOTE:** The forward clutch hub may remain in the shell during disassembly.

Remove the forward clutch hub and the No. 3 forward clutch hub front bearing.

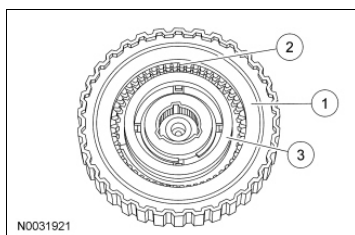


2. **NOTE:** To aid handling, the forward clutch assembly may be set in the extension housing or a hole in the work bench.

Remove the forward clutch pack selective retaining ring.

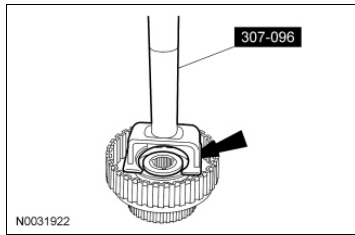


3. Remove the following components.
  1. Remove the pressure plate.
  2. Remove the clutch pack.
  3. Remove the pressure spring.



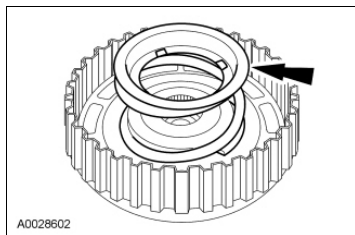
4. **NOTICE:** Apply only enough pressure to release pressure on the retaining ring. If too much pressure is applied, the spring may break.

Using the Clutch Spring Compressor, remove the forward clutch retaining ring.



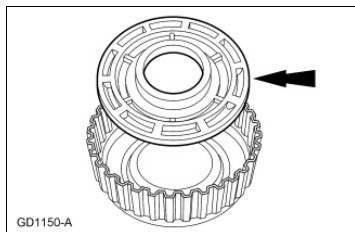
5. Slowly release the press and remove the forward clutch from the press.

6. Remove the forward clutch retainer and the return spring.

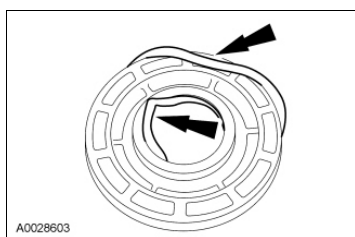


7. **NOTE:** Air pressure may be required to remove the forward clutch piston.

Remove the forward clutch piston.

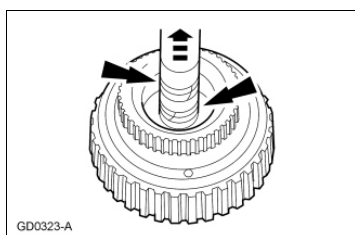


8. Remove the inner and outer forward clutch piston seals.

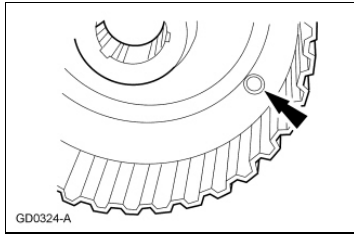


9. **NOTE:** The seals are solid seals, however, when installing new seals use scarf-cut seals.

Remove the forward clutch input shaft seals.



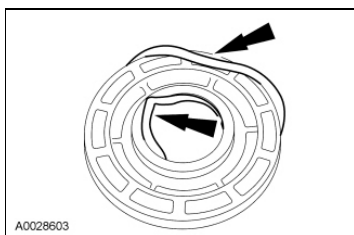
10. Make sure the check ball in the clutch cylinder is free and clean. Check for correct seating.



## Assembly

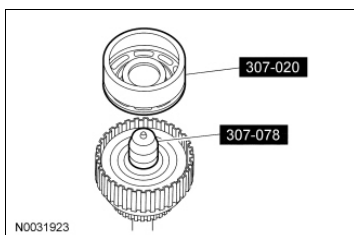
1. Inspect the clutch cylinder thrust surfaces, piston bore and clutch plate serrations for scores or burrs. Minor scores or burrs may be removed with crocus cloth. Install a new clutch cylinder if badly scored or damaged.
2. Check the transmission fluid passage in the clutch cylinder for obstructions. Clean out all transmission fluid passages. Inspect the clutch piston for scores and install a new piston if necessary. Inspect check balls for freedom of movement and correct seating.
3. Check the clutch release spring for distortion and cracks. Install a new spring (including the wave spring) if distorted or cracked.
4. Inspect composition clutch plates, steel clutch plates and clutch pressure plate for worn or scored bearing surfaces. Install new parts if they are deeply scored or burred.
5. Check the clutch plates for flatness and fit on the clutch hub serrations. Discard any plate that does not slide freely on serrations or that is not flat.
6. Check the clutch hub thrust surfaces for scores and the clutch hub splines for wear.
7. **NOTE:** To aid handling, the forward clutch assembly may be set in the extension housing or a hole in the work bench.

Install the inner and outer forward clutch piston seals. Note the direction of the sealing rings before installation.



8. **NOTE:** Coat the piston seals and clutch drum sealing area with petroleum jelly.

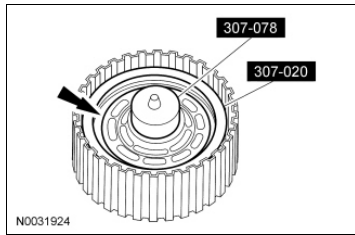
Position the Piston Seal Protectors on the clutch piston.



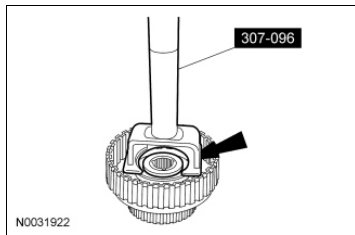
9. Using the Piston Seal Protectors, install the forward clutch piston into the clutch cylinder.



- Push the piston to the bottom of the cylinder using even pressure.



10. Using the Clutch Spring Compressor, compress the piston return spring and install the retaining ring.

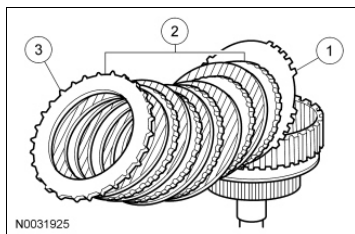


11. Slowly release the press pressure and remove the forward clutch from the press.

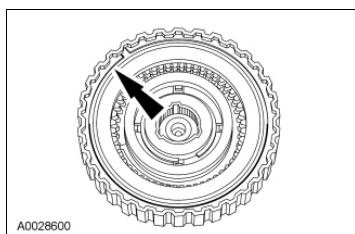
12. **NOTE:** Before assembly, soak the new clutch discs in transmission fluid.

Install the clutch pack assembly.

1. Install the pressure ring.
2. Install the clutch pack.
3. Install the pressure plate.

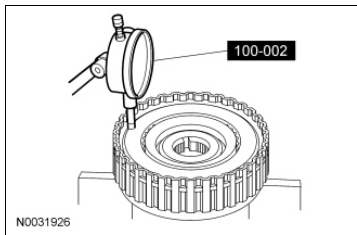


13. Install the clutch pack retaining ring.



14. Install the Dial Indicator Gauge with Holding Fixture on the forward clutch pack.

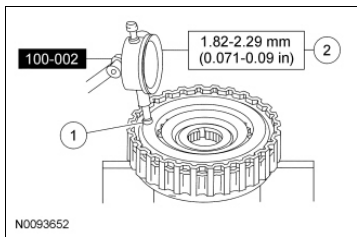
- Push downward on the clutch pack.
- Release pressure and zero the Dial Indicator Gauge.



15. Using the Dial Indicator Gauge with Holding Fixture, check the clutch pack clearance.
1. Lift up on the clutch pack until it fully seats against the clutch pressure plate retainer.
  2. Read the Dial Indicator Gauge.
- ♦ If the clearance is not within specifications, install the correct size retaining ring.

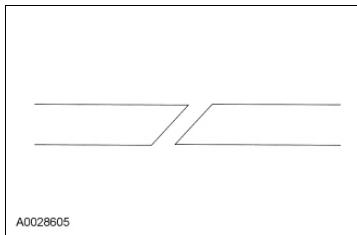
**Selective Retaining Ring**

Specification
1.72-1.82 mm (0.067-0.071 in)
1.93-2.03 mm (0.075-0.079 in)
2.13-2.23 mm (0.083-0.087 in)
2.33-2.43 mm (0.091-0.095 in)

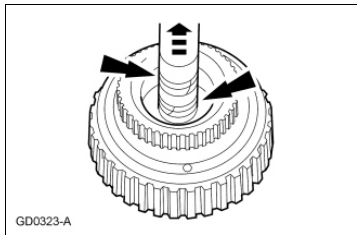


16. **NOTE:** Make sure the scarf-cut seals are mated correctly.

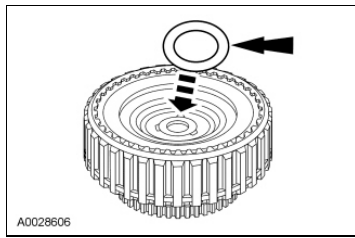
Slide the 2 scarf-cut seals on the input shaft.



17. Install the 2 scarf-cut seals on the input shaft.

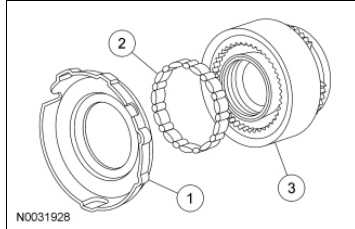


18. Install the No. 3 forward clutch hub front bearing and the forward clutch hub.



SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E2010 Crown Victoria, Grand Marquis  
Workshop ManualDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

Procedure revision date: 08/19/2009

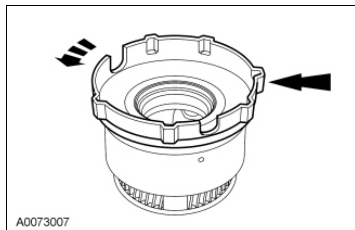
**Planetary Gear Support Assembly and Planetary One-Way Clutch**

Item	Part Number	Description
1	7A130	Planetary gear support
2	7A089	Planetary One-Way Clutch (OWC)
3	7A398	Planetary assembly

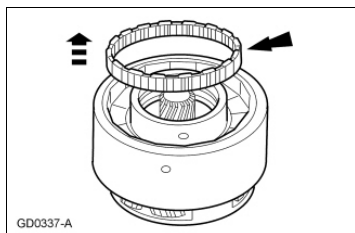
**Disassembly and Assembly**

1. **NOTE:** Inspect the outer and inner races for scores or damaged surface areas where rollers contact the races. Inspect the rollers and springs for excessive wear or damage. Inspect the spring and cage for bent or damaged spring retainers.

Rotate the center support counterclockwise and lift to remove the planetary gear support.



2. Remove the planetary One-Way Clutch (OWC).

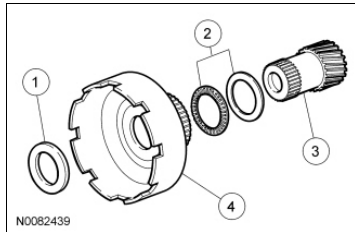


3. To assemble, reverse the disassembly procedure.



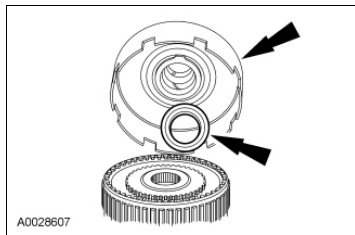
SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E2010 Crown Victoria, Grand Marquis  
Workshop ManualDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

Procedure revision date: 08/19/2009

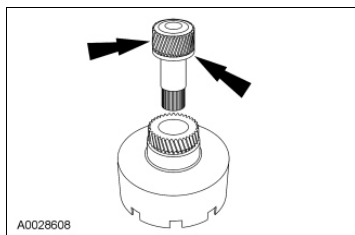
**Reverse Sun Gear****Disassembly**

Item	Part Number	Description
1	7C096	Forward clutch hub bearing No. 4
2	7D234/7D235	Forward clutch sun gear bearing and race No. 5 (2-piece bearing)
3	7A399	Forward clutch sun gear
4	7A019	Reverse sun gear assembly

1. Remove the reverse clutch sun gear assembly and the No. 4 forward clutch hub bearing and race.



2. Remove the forward clutch sun gear assembly and the No. 5 forward clutch sun gear bearing and race.

**Assembly**

1. The forward clutch sun gear and reverse sun gear assembly are assembled as part of the transmission assembly procedure.







SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E2010 Crown Victoria, Grand Marquis  
Workshop ManualDISASSEMBLY AND ASSEMBLY OF  
SUBASSEMBLIES

Procedure revision date: 08/19/2009

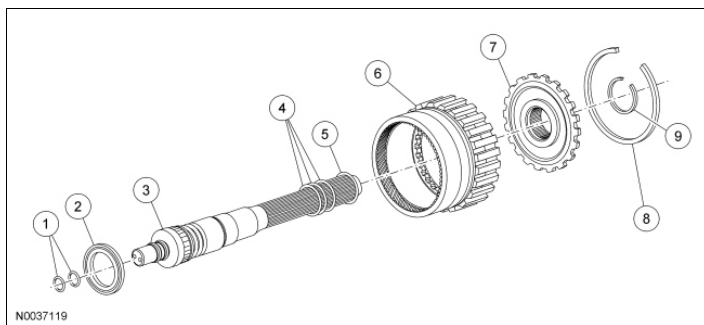
**Output Shaft and Direct Clutch Cylinder**

## Special Tool(s)

 ST1190-A	Compressor, Clutch Spring 307-015 (T65L-77515-A)
 ST2745-A	Installer, Teflon Seal 307-516 (kit consists of 307-516-1, 307-516-2, 307-516-3 and 307-516-4)
 ST1204-A	Protector, Piston Seal 307-080 (T80L-77234-A)
 ST1901-A	Protector, Transmission Direct Clutch Outer Fluid Seal 307-422

## Material

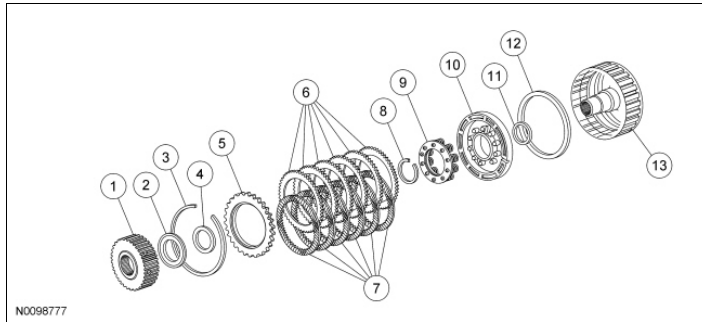
Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV

**Output Shaft and Hub Disassembled View**

Item	Part Number	Description
1	7F274	Output shaft to direct clutch cylinder seals (2 required)
2	7F240	Direct clutch outer bearing and race assembly No. 8
3	7060	Output shaft
4	7F273	Output shaft-to-case seals (3 required)



5	87054-S94	O-ring seal
6	7A233	Output shaft ring gear assembly
7	7D164	Output shaft hub
8	7C122	Retaining snap ring
9	97713-S	Snap ring

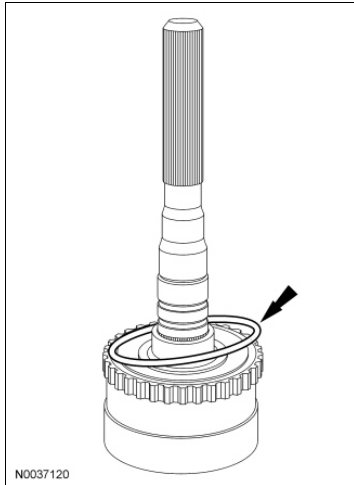
**Direct Clutch Disassembled View**

Item	Part Number	Description
1	7F236	Direct clutch hub
2	7F243	No. 7 direct clutch bearing
3	7D483	Direct clutch pressure plate retaining ring
4	7F237	Direct clutch inner bearing support
5	7B066	Direct clutch pressure plate
6	7B442	Direct clutch external spline plates (steel)
7	7B164	Direct clutch internal spline plates (friction)
8	388104-S2	Retaining ring
9	7F235	Direct clutch retainer and spring assembly
10	7A262	Direct clutch piston
11	7C099	Direct clutch piston inner seal
12	7A548	Direct clutch piston outer seal
13	7F283	Direct clutch cylinder

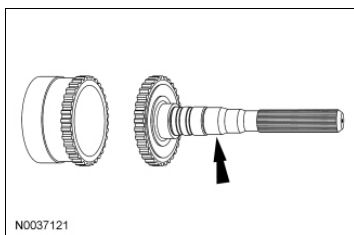
**Disassembly**

- NOTE:** The index mark on the output shaft must be aligned with the index mark on the output shaft ring gear during the assembly procedure.

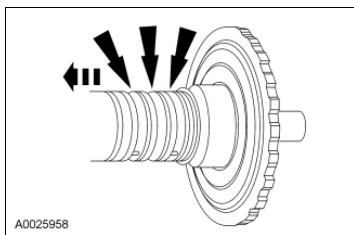
Remove the ring gear snap ring.



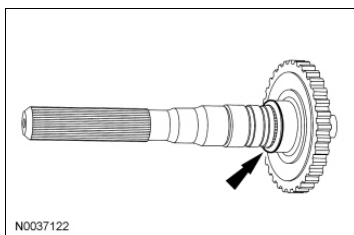
2. Separate the ring gear and output shaft.



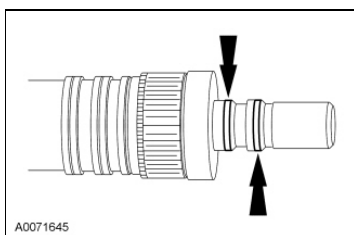
3. Remove the 3 output shaft seal rings.



4. Remove the output shaft hub snap ring and the output shaft hub.



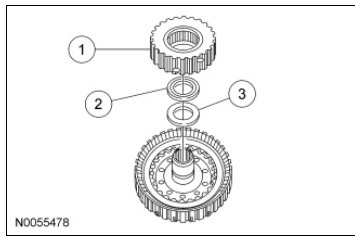
5. Remove the 2 direct clutch seal rings.



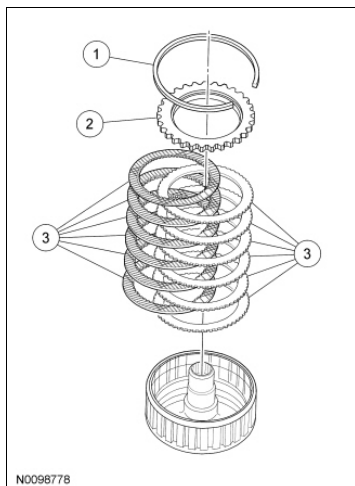
6. Remove the No. 7 direct clutch inner bearing support.

1. Remove the direct clutch hub.

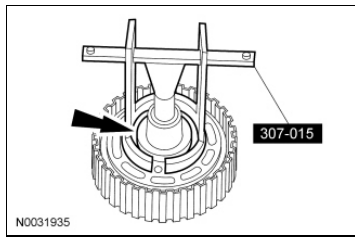
2. Remove the No. 7 direct clutch inner bearing.
3. Remove the direct clutch inner support.



7. Inspect the clutch cylinder thrust surfaces, piston bore and clutch plate serrations for scores or burrs. Minor scores or burrs may be removed with a crocus cloth. Install a new clutch cylinder if badly scored or damaged.
8. Check the transmission fluid passages in the clutch cylinder for obstructions. Clean out all transmission fluid passages. Inspect the clutch piston for scores and install new if necessary. Inspect the check balls for freedom of movement and correct seating.
9. Check clutch release spring for distortion and cracks. Install a new spring (including wave spring) if distorted or cracked.
10. Inspect composition clutch plates, steel clutch plates and clutch pressure plate for worn or scored bearing surfaces. Install new parts if they are deeply scored or burred.
11. Check the clutch plates for flatness and fit on the clutch hub serrations. Discard any plate that does not slide freely on the serrations or that is not flat.
12. Check the clutch hub thrust surfaces for scores and clutch hub splines for wear.
13. Check the direct clutch drum and selective ring groove for damage or excessive wear.
14. Remove the direct clutch pack.
  1. Remove the selective retaining ring.
  2. Remove the direct clutch pressure plate.
  3. Remove the direct clutch pack friction and steel plates.



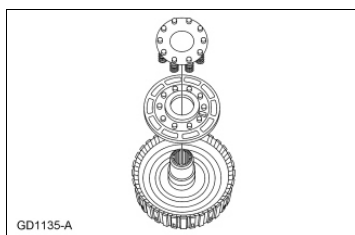
15. Using the Clutch Spring Compressor, compress the piston return spring and remove the snap ring.



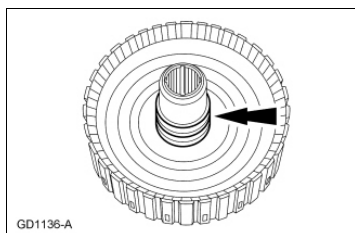
16. **⚠ WARNING:** When using compressed air, never let air pressure exceed 172 kPa (25 psi) and always wear safety glasses. Compressed air may cause foreign material or parts to become airborne. Failure to follow this instruction may result in serious personal injury.

**NOTE:** If necessary, use regulated compressed air 172 kPa (25 psi) maximum pressure to remove the clutch piston.

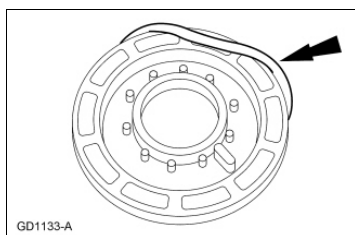
Remove the support and spring assembly and piston.



17. Remove the inner piston seal.



18. Remove the outer piston seal.

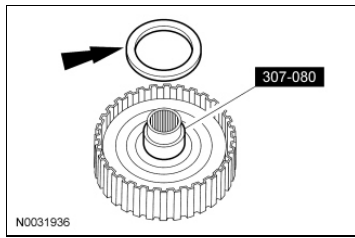


## Assembly

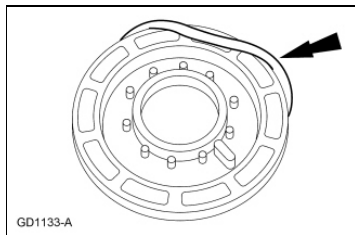
1. **NOTE:** Lubricate the direct clutch piston inner seal and seal protector with petroleum jelly.

Using the Piston Seal Protector, install the inner piston seal.

- Install the seal with sealing lip facing down.

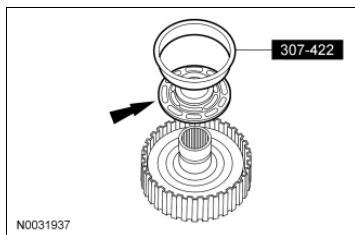


2. Install the clutch piston outer seal so that when the piston is installed, the sealing lip points toward the bottom of the cylinder.

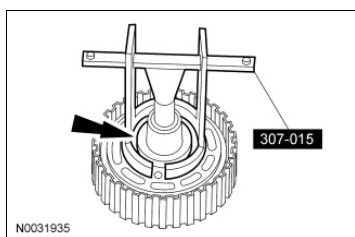


3. **NOTE:** Coat the inner and outer direct clutch piston seals, clutch cylinder sealing area and piston inner sealing area with petroleum jelly.

Using the Transmission Direct Clutch Outer Fluid Seal Protector, install the direct clutch piston.



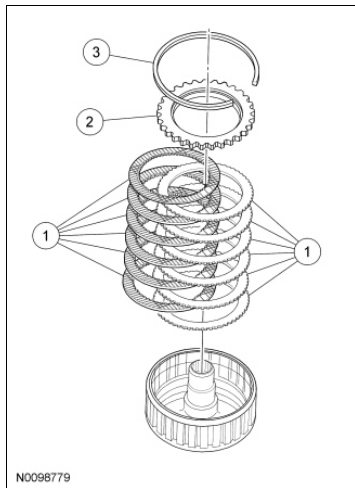
4. Install the piston return spring and retainer assembly.
5. Using the Clutch Spring Compressor, compress the piston return spring and install the retaining ring.



6. **NOTE:** Before assembly, soak the new clutch discs in transmission fluid.

Install the direct clutch pack.

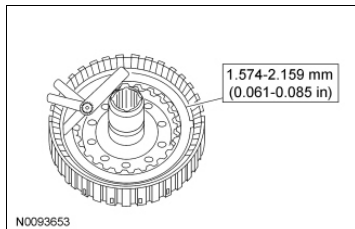
1. Install the direct clutch plates.
  - ◆ Alternate external spline (steel) plates and internal spline (friction) plates, starting with a steel plate and ending with the friction plate.
2. Install the direct clutch pressure plate. Make sure the pressure plate retaining ring groove is facing up.
3. Install the clutch pack retaining ring.



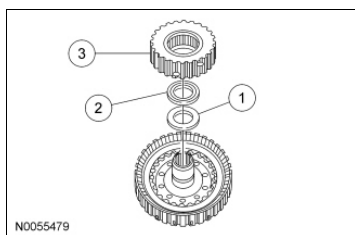
7. Use a feeler gauge to check the clearance between the clutch pack selective retaining ring and the pressure plate.
  - If the clearance is not within specifications, install the correct size retaining ring and recheck the clearance.

### Selective Retaining Ring

Specification
1.270-1.372 mm (0.05-0.054 in)
1.625-1.727 mm (0.063-0.067 in)
1.981-2.083 mm (0.077-0.082 in)
2.337-2.438 mm (0.092-0.095 in)

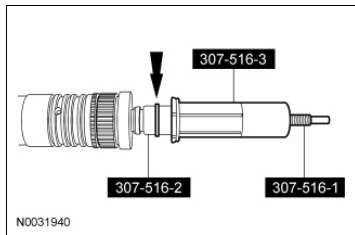


8. Install the direct clutch hub.
  1. Install the No. 7 direct clutch inner support with step side down.
  2. Install the No. 7 direct clutch bearing with the black marking up.
  3. Install the direct clutch hub.

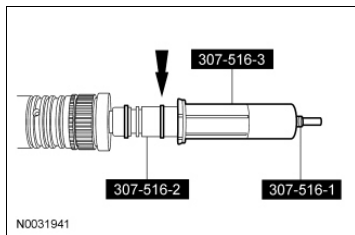


**NOTE:** Inspect the output shaft bearing surfaces for scores. Inspect the output shaft splines for wear. Inspect all bushings.

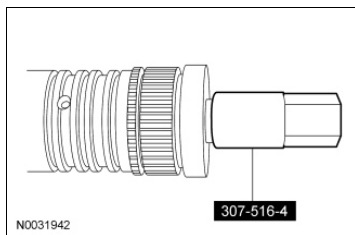
9. Using the Teflon Seal Installer (307-516-1, 307-516-2 and 307-516-3), install the first direct clutch seal ring.



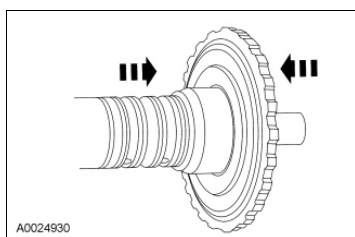
10. Using the Teflon Seal Installer (307-516-1, 307-516-2 and 307-516-3), install the second direct clutch seal ring.



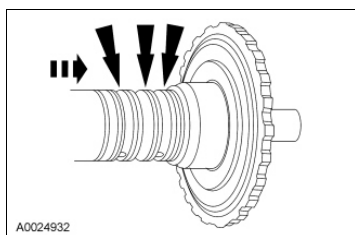
11. After both new seals have been installed, use the Teflon Seal Installer (307-516-4) to size the seals.



12. Install the output shaft hub.
- Position the output shaft hub.
  - Install the retaining ring.

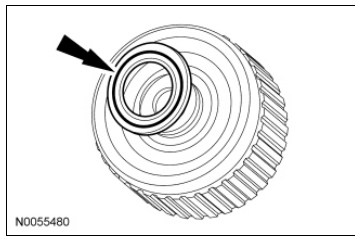


13. Install the 3 output shaft seal rings.



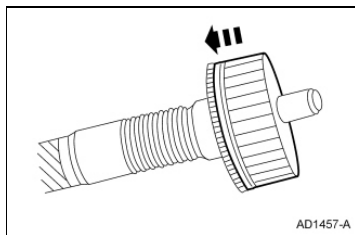
14. **NOTE:** The No. 8 bearing has a black oxide coating on the face. Install the No. 8 bearing with the black oxide coating facing up.

Coat the No. 8 needle bearing with transmission fluid and install the No. 8 needle bearing on the direct clutch cylinder.



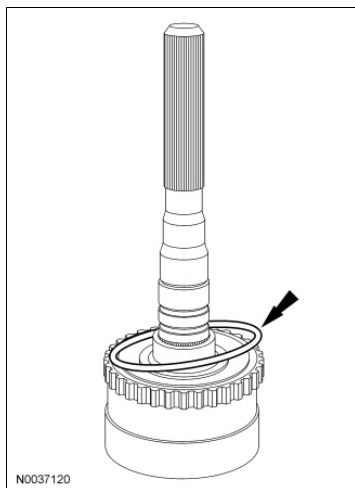
15. **NOTE:** Direct clutch cylinder may be installed after the output shaft ring gear is installed to the output shaft hub.

Assemble the direct clutch on the output shaft.



16. **NOTICE:** The index mark on the output shaft must be aligned with the index mark on the output shaft ring gear.

Align the index marks on output shaft and the output shaft ring gear and install the ring gear on the output shaft.




















SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
ASSEMBLY

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 04/16/2012

## Transmission

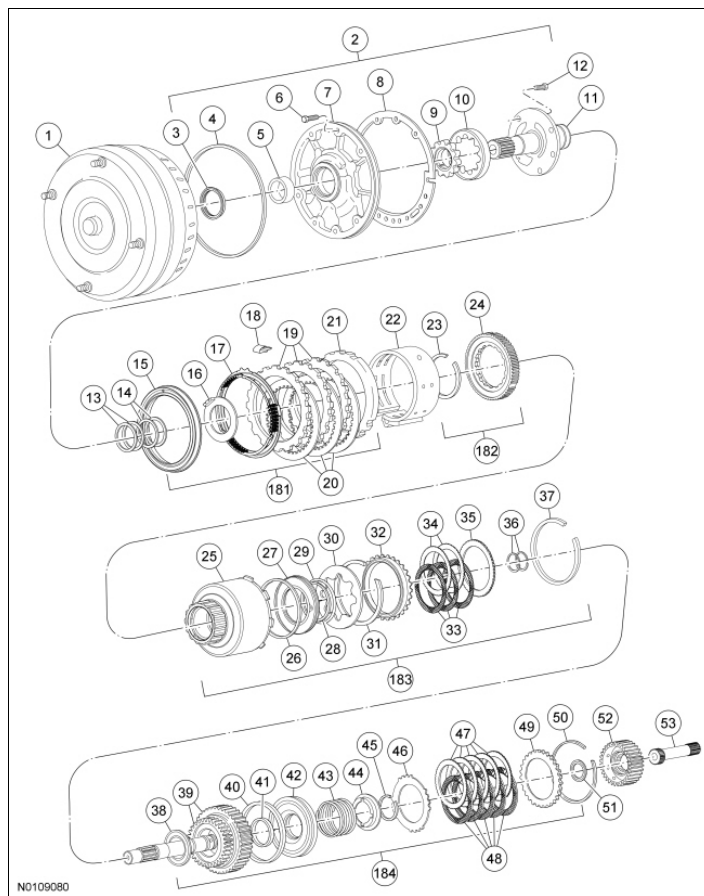
### Special Tool(s)

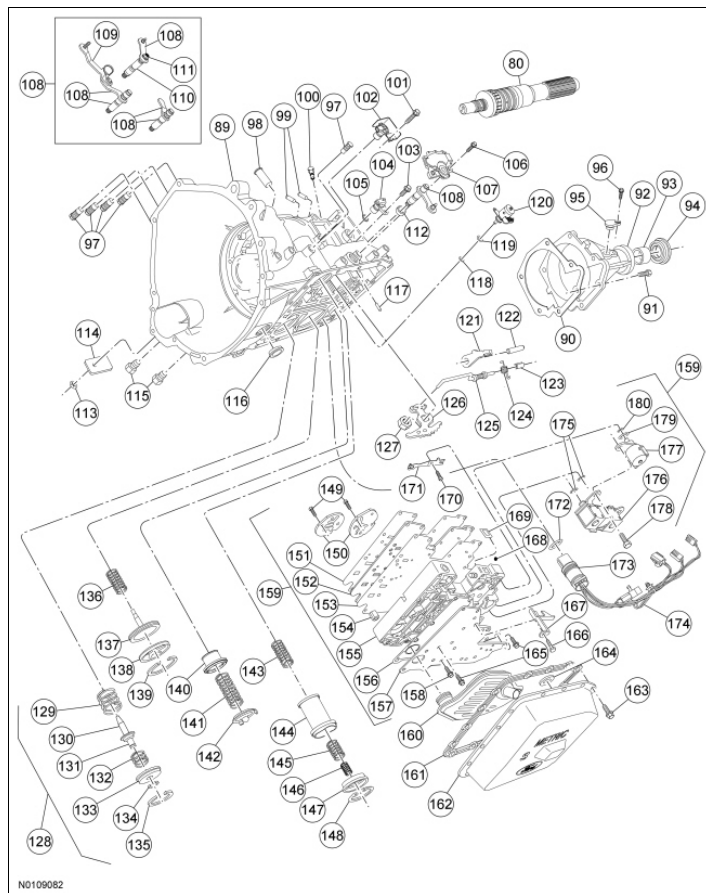
 ST1992-A	Air Test Plate, Transmission 307-246 (T92P-7006-A)
 ST1632-A	Alignment Gauge, TR Sensor 307-351 (T97L-70010-A)
 ST1214-A	Dial Indicator Gauge with Holding Fixture 100-002 (TOOL-4201-C)
 ST1631-A	Handle, Torque Converter 307-091 (T81P-7902-C)
 ST1202-A	Installer, Servo Piston 307-073 (T80L-77030-A)
 ST1199-A	Installer, Shift Shaft Fluid Seal 307-050 (T74P-77498-A)
 ST1188-A	Installer, Transmission Extension Housing Fluid Seal 308-002 (T61L-7657-A)
 ST1210-A	Remover/Installer, Servo Piston 307-251 (T92P-70023-A)
 ST1216-A	Remover/Installer, Transmission Extension Housing 307-077 (T80L-77110-A)
 ST2467-A	Rubber Tip Air Nozzle 100-D009 (D93L-7000-A)
 ST1197-A	Shim Selection Gauge 307-072 (T80L-77003-A)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST1940-A	Test Plate Screw Set, Transmission 307-126 (T82P-7006-C)

## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B

## Disassembled View



2140

1	7902	Converter assembly (model dependent)
2	7A103	Pump and piston assembly - transmission fluid
3	7A248	Seal assembly - pump
4	7A248	Seal - pump
5	7B258	Bushing - pump
6	N605789-S101	Bolt - M8-1.25 x 35 hex head (7 required, attaches 7A103 to 7005)
7	7A106	Body assembly - pump (part of 7A103)
8	7A136	Gasket - front pump
9	7H169	Gear - pump inner gerotor (part of 7A103)
10	7H169	Gear - pump outer gerotor (part of 7A103)
11	7A108	Support assembly - front pump
12	N605787-S1000	Bolt - M8-1.25 x 25 hex flange head (5 required, attaches 7A108 to 7A103)
13	7D020	Seals - reverse clutch cylinder (2 required)
14	7D019	Seals - forward clutch cylinder (2 required)
15	7E005	Piston and valve assembly - intermediate clutch
16	7D014	Washer - front pump support thrust - select fit No. 1
17	7F222	Spring and retainer - intermediate clutch piston return
18	7A609	Anti-rattle clip - intermediate clutch (model dependent)
19	7B442	Plates - intermediate clutch external spline (select fit) (steel)
20	7B164	Plate assembly - intermediate clutch internal spline (friction)
21	7B066	Plate - intermediate clutch pressure
22	7F196	Band assembly - overdrive
23	391267-S	Ring - 3-21/64 retains type SU external (retains 7A089 to 7D044)
24	7A089	Clutch assembly - intermediate one-way rocker clutch
25	7D044	Drum assembly - reverse clutch
26	7D403	Seal - reverse clutch piston outer
27	7D402	Piston assembly - reverse clutch
28	7D404	Seal reverse clutch piston inner
29	7D256	Ring - reverse clutch piston pressure
30	7B070	Spring - reverse clutch piston return
31	7A577	Retainer - reverse clutch piston spring
32	7B066	Plate - reverse clutch front pressure
33	7B164	Plates - reverse clutch internal spline (friction)
34	7B442	Plates - reverse clutch external spline (steel)
35	7B066	Plate - reverse clutch rear pressure
36	7B497	Seals - input shaft (2 required)
37	7D483	Retainer - reverse clutch pressure plate - select fit

38	7A166	Bearing and race assembly - forward clutch No. 2
39	7F207	Cylinder and input shaft assembly - forward clutch
40	7A548	Seal - forward clutch piston outer
41	7C099	Seal - forward clutch piston inner
42	7A262	Piston - forward clutch
43	7A480	Spring - forward clutch piston return
44	7A527	Retainer return spring - forward clutch
45	388099-S	Snap ring - retaining - 1-59/64 (retains 7A527 in 7F207)
46	7E085	Spring - rear clutch pressure plate (model dependent)
47	7B442	Plates - forward clutch external spline (steel)
48	7B164	Plates - forward clutch internal spline (friction)
49	7B066	Plate - forward clutch pressure
50	7D483	Snap ring - retaining (select fit)
51	7F231	Bearing and race assembly - forward clutch front No. 3
52	7B067	Hub - forward clutch
53	7F351	Shaft - intermediate stub
54	7C096	Bearing and race assembly - forward clutch hub No. 4
55	7A019	Gear assembly - reverse clutch sun
56	7D234/7D235	Bearing and race assembly - forward clutch sun gear No. 5
57	7D483	Retaining ring - center support - 7-7/32
58	7A399	Gear assembly - forward clutch sun
59	7F277	Spring - case to planet support
60	7A130	Support assembly - planetary gear
61	7A089	One-Way Clutch (OWC) cage spring and roller assembly - planetary
62	7A398	Planetary assembly (model dependent)
63	7D095	Band assembly - reverse
64	392004-S300	Retaining ring - 0.58 thick (locates reverse band during assembly)
65	7F236	Hub - direct clutch
66	7F243	Bearing and race assembly - direct clutch inner No. 7
67	7F237	Support - direct clutch inner bearing
68	7D483	Retaining ring - direct clutch pressure plate (select fit)
69	7B066	Plate - direct clutch pressure
70	7B164	Plates - direct clutch internal spline (friction)
71	7B442	Plates - direct clutch external spline (steel)
72	388104-S	Retainer ring - 1-19/32 (retains 7F235 to 7F283)
73	7F235	Retainer and spring assembly - direct clutch
74	7A262	Piston assembly - direct clutch

75	7C099	Seal - direct clutch piston inner
76	7A548	Seal - direct clutch piston outer
77	7F283	Cylinder assembly - direct clutch
78	7F274	Seals - output shaft small - direct clutch (2 required)
79	7F240	Bearing and race assembly - direct clutch outer No. 8
80	7060	Shaft assembly - output (model dependent)
81	7F273	Seals - output to case shaft large (3 required)
82	87054-S94	Seal - O-ring (piloted output shaft only) (model dependent)
83	7A233	Gear - output shaft ring
84	7D164	Hub - output shaft
85	97713-S	Snap ring - 1-13/16 retaining (retains 7D164 to 7060)
86	7C122	Snap ring - retaining (retains 7D164 to 7A153 to 7A233)
87	7025	Bushing - rear case
88	7F242	Bearing and race assembly - case rear No. 9
89	7005	Case assembly
90	7086	Gasket - extension (model dependent)
91	N803747-S102	Bolt - M8-1.25 x 30 (6 required, attaches 7A039 to 7005) (model dependent)
92	7A039	Extension housing assembly
93	7A034	Bushing - extension housing (part of 7A039)
94	7052	Seal assembly - extension housing (model dependent)
95	7H183	Extension housing plug (includes O-ring 87036-S94)
96	57621-S2	Extension housing plug bolt and washer
97	390318-S100	Pipe plugs - 1/8-27 Dryseal tapered (5 required)
98	7F295	Pin - overdrive band anchor
99	388142-S	Pins - reverse band anchor (part of 7005)
100	7A246	Vent assembly - case
101	W700005-S309	Bolt - M6-1.0 x 25 hex flange HD (attaches TSS sensor to case)
102	7M101	Sensor assembly - transmission TSS sensor
103	N605771-S427	Bolt - M6-1.0 x 14 hex head (attaches output shaft speed sensor to case)
104	7H103	Sensor assembly - transmission Output Shaft Speed (OSS)
105	N811757-S100	Seal - 14.0 x 1.78 O-ring
106	W500015-S309	Bolt and washer assembly - M6-1.0 x 25 mm (1 in) (2 required, attaches 7F293 to 7005) (model dependent)
107	7F293	Sensor - Transmission Range (TR)
108	7A256	Lever assemblies - manual control (model dependent)

109	7H296	Link assembly - manual control (model dependent)
110	7C493	Shaft - transmission manual control lever (model dependent)
111	N808737-S427	Nut - M10-1.5 (attaches 7A256 to 7C493)
112	7B498	Seal assembly - manual control lever
113	373907-S2	Nut - 1/4 spring (retains identification tag to 7000)
114	7B148	Tag - identification (part of 7005)
115	7D273	Connector assembly - transmission fluid cooler tube case fittings (2 required)
116	7N171	Plug - converter housing access
117	7B210	Pin - manual lever shaft retainer
118	391131	Seal - 0.426 x 0.070 O-ring
119	N805862-S	Seal - 14.0 x 1.78 O-ring
120	7G383	Solenoid valve - transmission Electronic Pressure Control (EPC)
121	7A441	Pawl - park pawl
122	7D071	Shaft - park pawl
123	7D419	Cup - park rod guide (part of 7A039)
124	7D070	Spring - park pawl return
125	7A232	Rod assembly - park pawl actuating
126	7A115	Lever assembly - manual valve detent lever
127	N800287-S536	Nut - M14 x 1.5 hex intermediate detent lever (attaches 7A115 to 7A256)
128	7H188	Piston assembly - overdrive servo
129	7F201	Spring - overdrive servo piston
130	7F203	Rod - overdrive servo actuating
131	7H179	Washer - backup overdrive servo belleville
132	7G277	Spring - belleville overdrive cushion spring
133	7F200	Piston assembly - overdrive servo
134	97411-S	Ring - retaining (retains 7F200 to 7F203)
135	391377-S	Ring - 2.85 retaining type TVP "H" internal (retains 7H188 to 7005)
136	7D031	Spring - reverse band servo piston
137	7D189	Piston assembly - reverse band servo
138	7D036	Cover assembly - reverse band servo piston
139	388215-S100	Retaining ring internal - 3-13/16
140	7H292	Piston and seal assembly - 2-3 accumulator (bonded seals)
141	7F285	Ring - 2-3 shift accumulator piston (model dependent)
142	7B264	Retainer - 2-3 shift accumulator spring
143	7F284	Spring - 1-2 shift accumulator (model dependent)
144	7F251	Piston assembly - 1-2 shift accumulator (bonded seals)
145	7F284	Spring - 1-2 shift accumulator



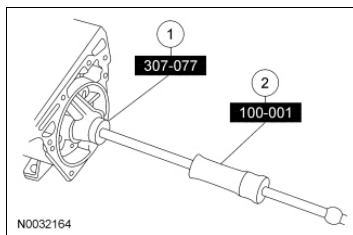
146	7F284	Nested spring - 1-2 (inner spring) (vehicle dependent)
147	7F247	Cover and seal assembly - 1-2 accumulator
148	7384	Ring - 2-1/16 retaining type HU internal (retains 7F247 to 7005)
149	N807178-S1000	Bolts - M6-1.0 x 18 hex head (12 required attaches reinforcing plate to valve body)
150	7F282	Plates - valve body reinforcing (part of 7A100)
151	7C155	Gasket - valve body separator upper
152	7A008	Plate - control valve body separator (part of 7A100)
153	7D100	Gasket - valve body separator lower
154	7D174	Valve - converter drainback
155	7A091	Body assembly - main control
156	7H173	Gasket - valve body cover plate
157	7C034	Plate - valve body cover (part of 7A100)
158	N807178-S1000	Bolt - M6-1.0 x 18 hex head (11 required, attaches 7C034 to 7A100) (part of 7A100)
159	7A100	Control assembly - main (model dependent)
160	7A098	Filter and seal assembly - transmission fluid
161	7A191	Gasket - transmission fluid pan
162	7A194	Pan - transmission fluid
163	N605785-S1036	Bolt - M8-1.25 x 18 hex flange head (14 required, attaches 7A194 to 7005)
164	7L027	Magnet - ceramic case (part of 7A194)
165	N808947-S1300	Bolt - M8-1.25 x 46 hex shoulder pilot (2 required, attaches 7C034 to 7A100)
166	N807179-S1000	Bolt - M6-1.0 x 52 hex flange head (12 required, attaches 7A100 to 7005)
167	7H111	Retainer - solenoid
168	7E195	Ball - 1/4 diameter coast booster valve shuttle (8 required)
169	7H187	Screen - solenoid pressure supply
170	N800670-S1000	Bolt - M6-1.0 x 40 hex flange head (13 required, attaches 7A100 to 7005)
171	7E332	Spring assembly - manual valve detent
172	7Z276	Seal - 0.864 x 0.070 O-ring (2 required)
173	7G276	Transmission internal harness connector
174	7G276	Harness assembly
175	7Z484	Seals - 6.07 x 1.70 O-ring (2 required)
176	7G484	Solenoid valve - transmission shift
177	7G136	Solenoid valve - transmission Torque Converter Clutch (TCC)
178	N807178-S1000	Bolt - M6-1.0 x 16 hex head (retains 7D136 and 7G484 to 7A100)
179	7Z136	Seal - 0.489 x 0.070 O-ring
180	7Z484	Seal - 0.176 x 0.070 O-ring

181	-	Intermediate clutch assembly
182	-	Intermediate OWC
183	-	Reverse clutch assembly
184	-	Forward clutch assembly
185	-	Direct clutch assembly

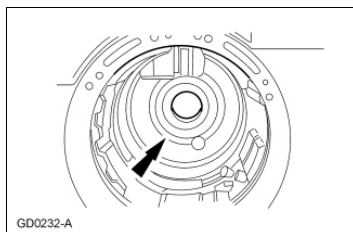
**NOTICE:** Before beginning assembly, carry out and inspect the following:

- When building up subassemblies and assembling the transmission, ALWAYS use new gaskets and seals.
- All fasteners must be tightened to the torque specification indicated. In addition to appearing in the section, the necessary torques can be found in the Torque Specifications chart.
- When building up subassemblies, each component part should be lubricated with transmission fluid. It is also good practice to lubricate the subassemblies as they are installed in the case.
- Needle bearings, thrust washers and seals should be lightly coated with petroleum jelly during subassembly buildup or transmission assembly.
- Many components and surfaces in the transmission are precision machined. Careful handling during disassembly, cleaning, inspection and assembly can prevent unnecessary damage to machined surfaces.

1. Using the Transmission Extension Housing Remover/Installer and Slide Hammer, install the rear case bushing if removed.
  1. Position the rear case bushing and the Transmission Extension Housing Remover/Installer and Slide Hammer inside the case.
  2. Assemble the Transmission Extension Housing Remover/Installer and Slide Hammer through the back of the case.

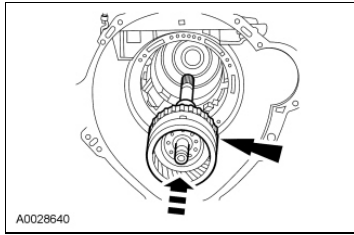


2. Place the transmission in the vertical position.
3. Coat the No. 9 case rear bearing with petroleum jelly and install on the case boss.

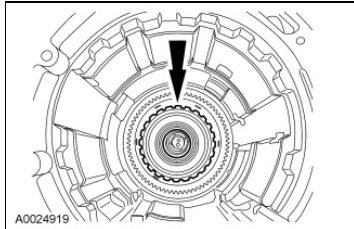


4. **NOTICE:** Make sure the No. 7 and No. 8 needle bearings and direct clutch hub are installed as shown in the Subassembly section. Internal damage and shift problems may occur to the transmission.

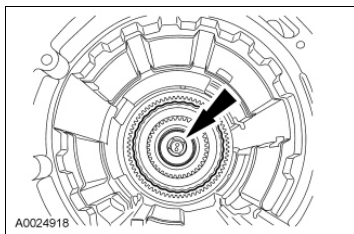
Install the output shaft and output shaft ring gear.



5. Coat the No. 8 bearing with transmission fluid and install the No. 8 bearing.

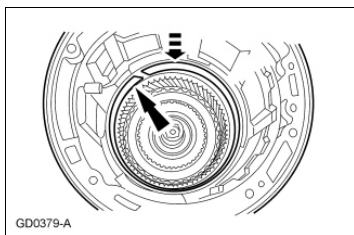


6. Install the direct clutch, No. 7 bearing and support.



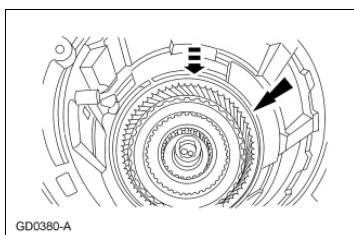
7. **NOTE:** The reverse band support retaining ring is used for assembly purposes during production. The reverse band support retaining ring is not required during assembly and it will not affect the operation of the transmission.

Install the reverse band support retaining ring.



8. **NOTE:** Make sure the band is seated on the anchor pins.

Install the reverse band.

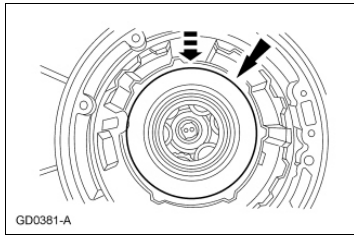


9. **NOTE:** The planetary assembly and planetary gear support cannot be installed unless the notch cut in the planetary gear support is aligned with the overdrive band anchor pin.

**NOTE:** The top of the planetary gear support must be below the snap ring groove.

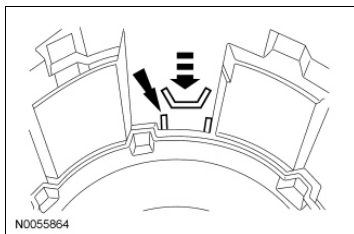
Install the planetary assembly and planetary gear support as a unit.

- Rotate the output shaft to fully seat the planetary assembly.



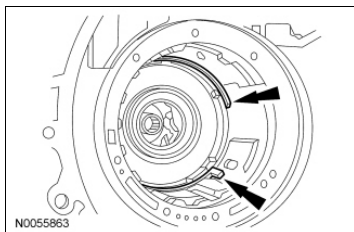
10. **NOTE:** The planet support spring must be compressed and installed below the snap ring groove. When the planet support spring is installed correctly, both ends of the spring will be visible.

Install the case to the planet support spring located at the 1 o'clock position.

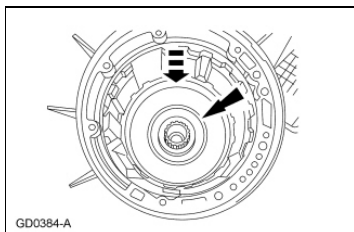


11. **NOTE:** When installing the center support retaining ring the opening of the center support retaining ring should be toward the hole in the case where the Turbine Shaft Speed (TSS) sensor would go.

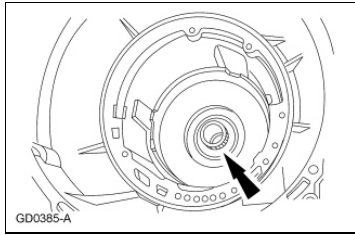
Install the center support retaining ring.



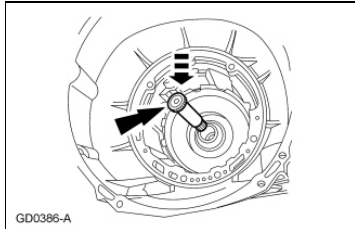
12. Install the forward clutch sun gear, the No. 5 forward clutch sun gear 2 piece bearing and the reverse sun gear.



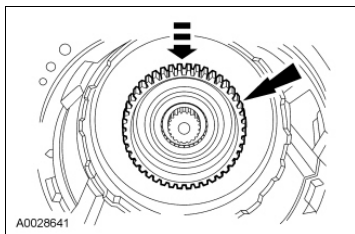
13. Install the No. 4 forward clutch hub bearing.



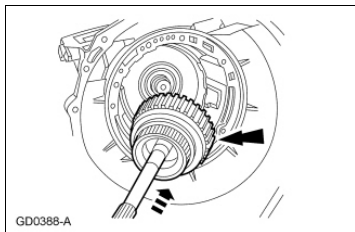
14. Install the intermediate stub shaft.



15. Install the forward clutch hub and the No. 3 forward clutch hub front bearing.



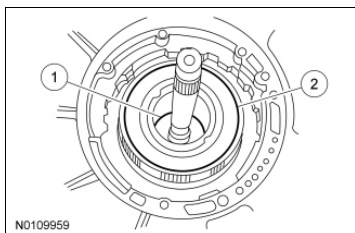
16. Install the forward clutch assembly.



17. **NOTE:** Make sure the reverse clutch cylinder lugs are completely seated in the notches of the reverse sun gear.

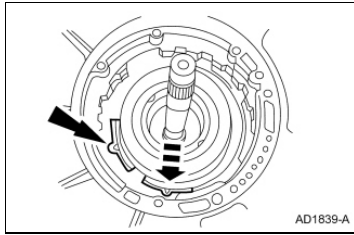
Install the reverse clutch cylinder assembly.

1. Install the No. 2 forward clutch bearing.
2. Install the reverse clutch cylinder.

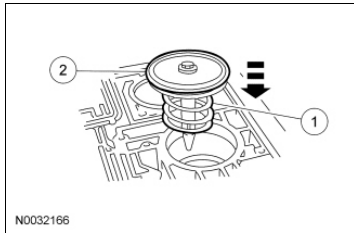


18. Install the overdrive band.

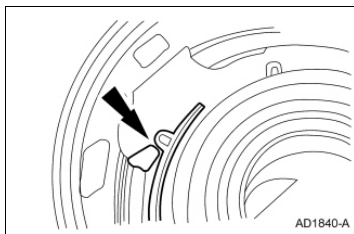
- Position the overdrive band pocket onto the anchor pin.



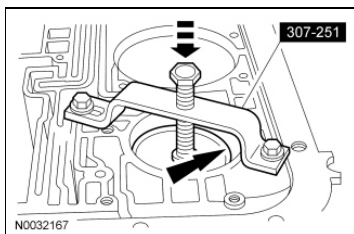
19. Install the overdrive servo spring.
1. Install the overdrive servo piston return spring.
  2. Install the overdrive servo piston.



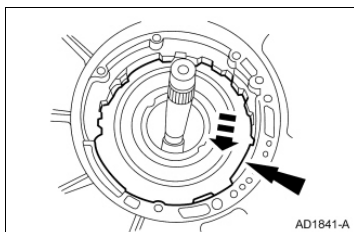
20. Verify the tip of the piston assembly engages the pocket of the overdrive band.



21. Using the Servo Piston Remover/Installer, compress the overdrive servo assembly and install the overdrive servo retaining ring.

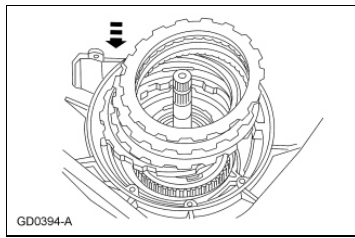


22. Install the intermediate clutch pressure plate.



23. **NOTE:** Before assembly, soak the new clutch discs in transmission fluid.

Install the intermediate clutch pack and selective steel plate.



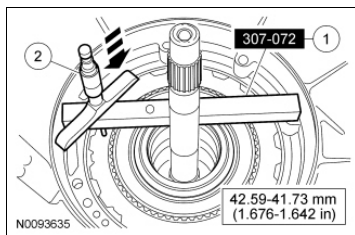
24. Using the Shim Selection Gauge, check the intermediate clutch clearance.

1. Position the Shim Selection Gauge on the pump case mounting surface.
2. Maintaining downward pressure, use a depth micrometer to measure and verify intermediate clutch clearance is within specification.

If the intermediate clutch is not within specification, install a correct selective plate.

### Selective Steel Plates

Specification
1.80-1.70 mm (0.07-0.066 in)
2.05-1.95 mm (0.08-0.076 in)
2.31-2.20 mm (0.09-0.086 in)
2.56-2.46 mm (0.1-0.096 in)

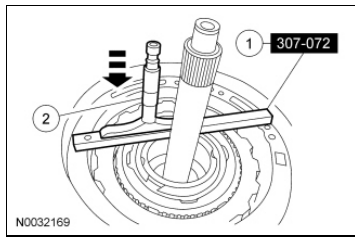


25. Using the Shim Selection Gauge, measure end clearance for the No. 1 front pump thrust washer.

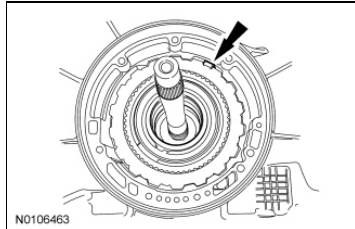
1. Position the Shim Selection Gauge on the pump case mounting surface.
2. Maintaining downward pressure, use a depth micrometer to measure end play clearance. Use the No. 1 thrust washer chart to select the correct washer.

### No. 1 Thrust Washer Chart

Depth	Thickness	Color Code
37.706-38.184 mm (1.484-1.503 in)	1.270-1.372 mm (0.05-0.054 in)	Green
38.185-38.641 mm (1.503-1.521 in)	1.727-1.829 mm (0.067-0.072 in)	Yellow
38.642-39.073 mm (1.521-1.538 in)	2.159-2.261 mm (0.085-0.089 in)	Natural
39.074-39.505 mm (1.538-1.555 in)	2.591-2.692 mm (0.102-0.105 in)	Red
39.506-40.165 mm (1.555-1.581 in)	3.023-3.124 mm (0.119-0.122 in)	Blue

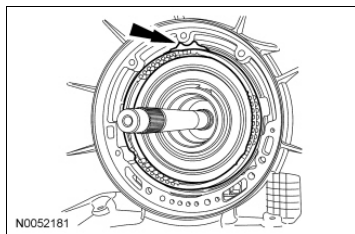


26. Install the intermediate clutch anti-rattle clip, if equipped.



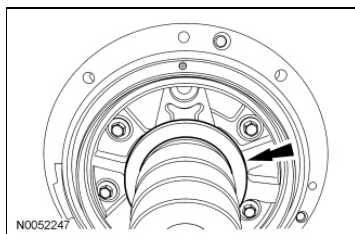
27. **NOTE:** Align the intermediate clutch return spring pack indent with the pump check ball.

Install the intermediate clutch return spring pack.



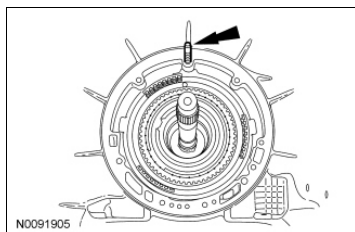
28. Install the No. 1 front pump support thrust washer.

- Use transmission assembly lube to hold the washer in place.



29. **NOTE:** The alignment pin is a fabricated M8 x 1.25 mm (0.049 in) bolt with the head removed.

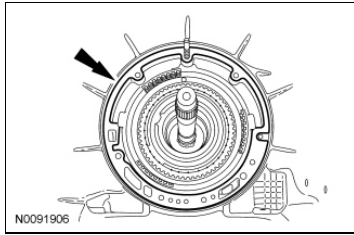
Install an alignment pin at the top of the case.



30. **NOTE:** Make sure the front pump gasket is positioned correctly and the case passages are not covered.

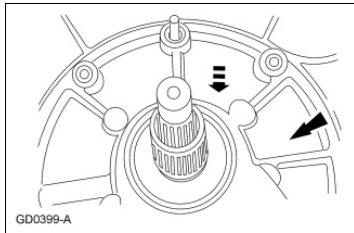
Install the front pump gasket.





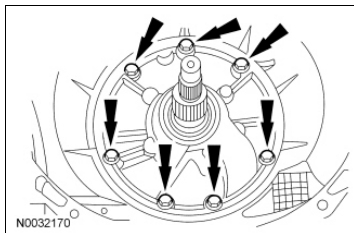
31. **NOTE:** To aid assembly, shake the input shaft while pushing down on the front pump.

Install the front pump assembly.



32. Remove the alignment pin and install the front pump bolts.

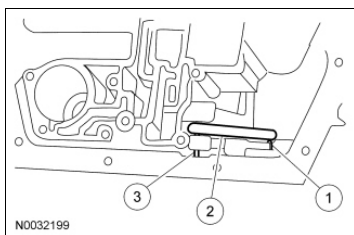
- Alternate bolt tightening to set the pump.
- ◆ Tighten to 27 Nm (20 lb-ft).



33. Rotate the transmission to the horizontal position.

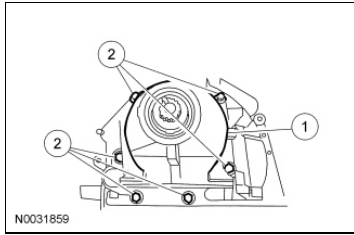
34. Install the park pawl.

1. Position the park pawl return spring.
2. Position the park pawl.
3. Install the park pawl shaft.



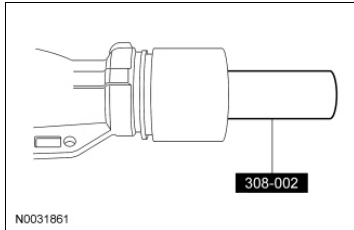
35. Install a new extension housing gasket and the extension housing.

1. Position the extension housing.
2. Install the 4 bolts and 2 stud bolts.
- ◆ Tighten to 55 Nm (41 lb-ft).



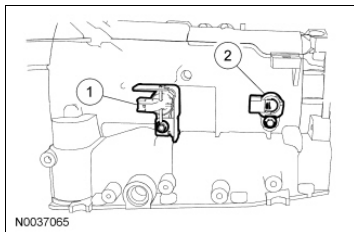
36. **NOTE:** When installing the new seal, make sure that the drain hole in the seal is in the 6 o'clock position.

Using the Transmission Extension Housing Fluid Seal Installer, install a new extension housing seal.

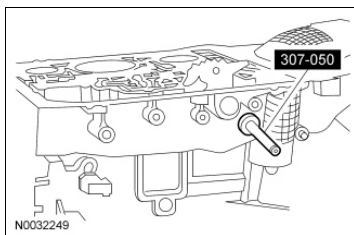


37. Install the Output Shaft Speed (OSS) sensor and the TSS sensor.

1. Install the TSS sensor and the bolt.
  - ◆ Tighten to 11 Nm (97 lb-in).
2. Install the OSS sensor and the bolt.
  - ◆ Tighten to 12 Nm (106 lb-in).

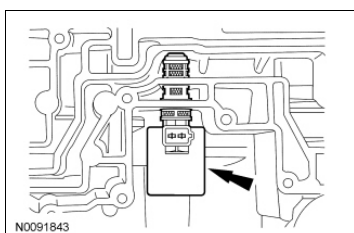


38. Using the Shift Shaft Fluid Seal Installer, install the manual control lever seal.

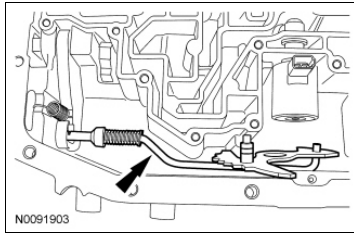


39. **NOTE:** Lubricate the Electronic Pressure Control (EPC) solenoid O-rings with transmission fluid.

Lubricate the EPC solenoid and install it into the case.

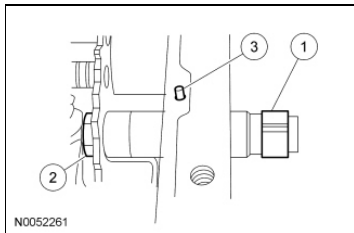


40. Install the manual control valve detent lever and park lever actuating rod.



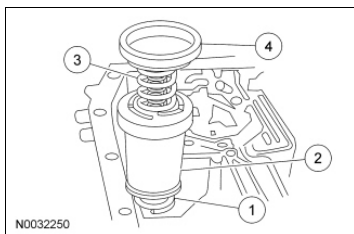
41. Install the manual control lever shaft.

1. Slide the manual control lever shaft into the case.
2. Install the manual control lever shaft inner nut.
  - ◆ Tighten to 32 Nm (24 lb-ft).
3. Install the manual control lever shaft retaining pin.

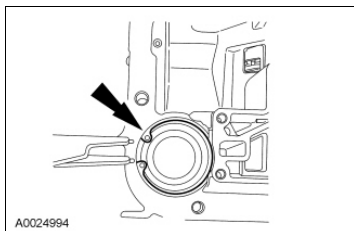


42. Install the 1-2 accumulator piston assembly.

1. Install the 1-2 accumulator upper spring.
2. Install the 1-2 accumulator.
3. Install the inner and outer 1-2 lower accumulator spring.
4. Install the 1-2 accumulator cover and seal.



43. Install the 1-2 accumulator retaining ring.

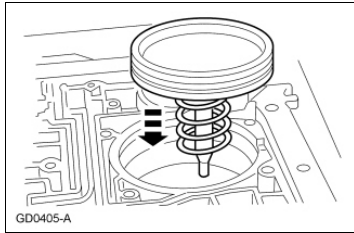


44. **NOTE:** This is not an ordinary installation procedure and does not compensate for band wear. When new piston and rod assembly installation becomes necessary or when a new reverse band has been installed, the reverse piston and rod length must be adjusted.

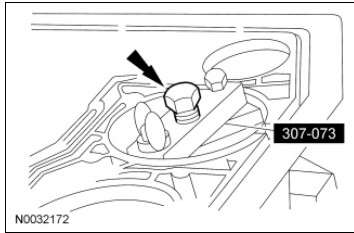
**NOTE:** Lubricate the reverse piston seal with transmission fluid to facilitate assembly and prevent damage to the seal.

**NOTE:** Do not install the reverse servo piston cover and seal at this time.

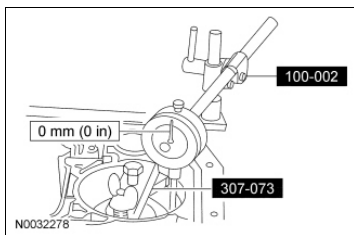
Install the reverse servo piston and rod assembly.



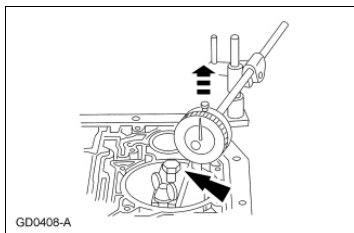
45. Install the Servo Piston Installer and tighten the band apply bolt.
- Tighten to 5.6 Nm (50 lb-in).



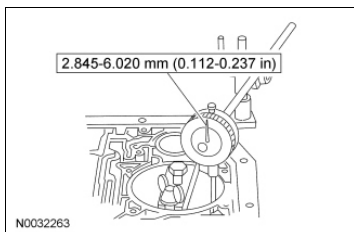
46. Install the Dial Indicator Gauge with Holding Fixture.
- Position the Dial Indicator stem on the flat portion of the reverse servo piston and zero the Dial Indicator Gauge.



47. Loosen the bolt until the piston stops against the Dial Indicator Gauge.

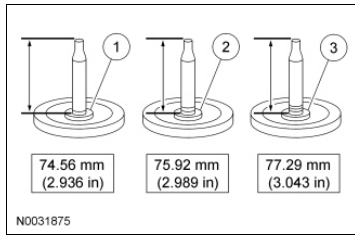


48. Verify that the amount of piston travel on the Dial Indicator Gauge is within specification.

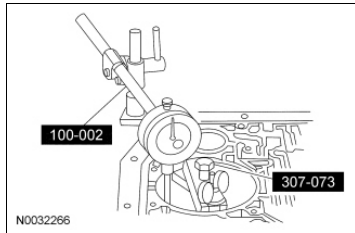


49. If piston travel is not within specification, select and install the correct servo assembly to bring the servo piston travel within specification.
1. One groove
  2. Two grooves

### 3. Three grooves

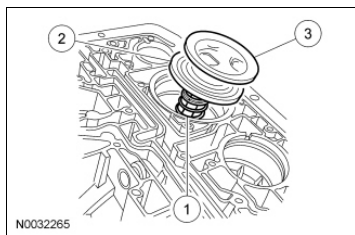


50. Remove the Dial Indicator Gauge with Holding Fixture.



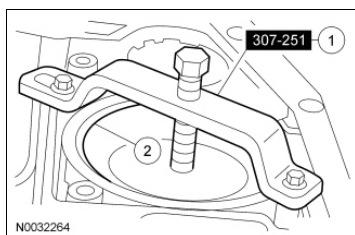
51. Install the reverse servo assembly.

1. Install the rod.
2. Install the piston assembly.
3. Install the reverse servo piston cover and seal.



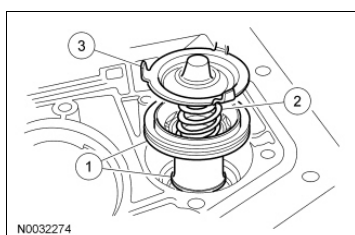
52. Using the Servo Piston Remover/Installer, install the reverse servo retaining ring.

1. Compress the reverse band servo.
2. Install the reverse band servo retaining ring.

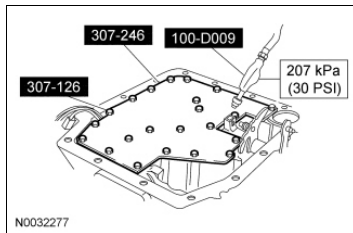


53. Install the 2-3 accumulator assembly.

1. Install the accumulator piston.
2. Install the accumulator piston spring.
3. Install the accumulator spring retainer.

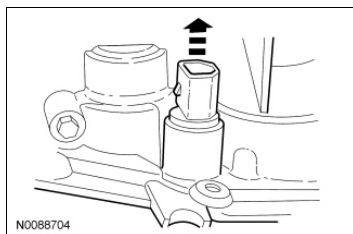


54. Using the Transmission Air Test Plate and Transmission Test Plate Screw Set, use a Rubber Tip Air Nozzle to apply regulated air pressure to the test ports. Verify that the components are applied and released.



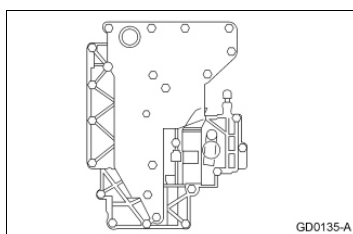
55. **NOTE:** The tab on the transmission internal harness connector is secured by the main control valve body.

Inspect the transmission internal harness connector O-ring for nicks or cuts. If damage is indicated, install a new O-ring. Install the transmission internal harness connector into the case.



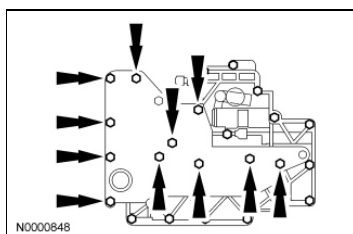
56. **NOTE:** The alignment bolts are valve body assembly bolts and are in the valve body.

Align the main control valve body alignment bolts and position the main control valve body.

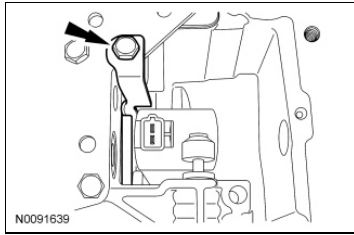


57. **NOTE:** The main control valve body bolts will be tightened in later steps.

Loosely install the 11 long main control valve body bolts.

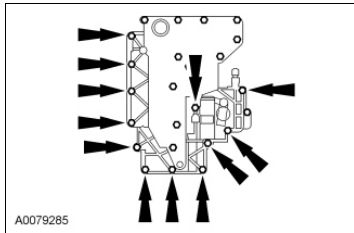


58. Install the EPC solenoid bracket and loosely install the bolt.

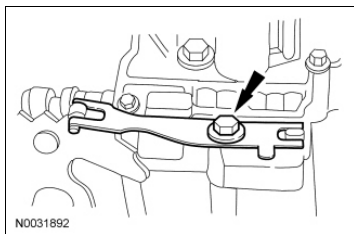


59. **NOTE:** The main control valve body bolts will be tightened in later steps.

Loosely install the 12 short main control valve body bolts.

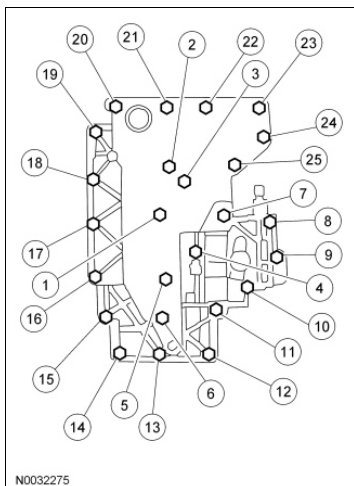


60. Install the manual control valve detent lever spring and loosely install the bolt.



61. Tighten the bolts in the sequence shown.

- Tighten to 10 Nm (89 lb-in).

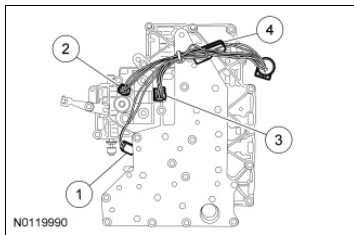


62. Inspect the transmission internal harness for damage.

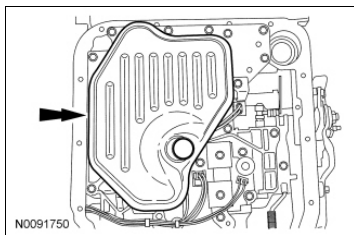
63. Connect the transmission internal harness to the solenoids.

1. Connect the EPC solenoid by pressing it in place by hand and fully seating the connector in place.
2. Connect the Torque Converter Clutch (TCC) by pressing it in place by hand and fully seating the connector in place.

3. Connect Shift Solenoid A (SSA) and Shift Solenoid B (SSB) by pressing it in place by hand and fully seating the connector in place.
4. Connect the Transmission Fluid Temperature (TFT) sensor.

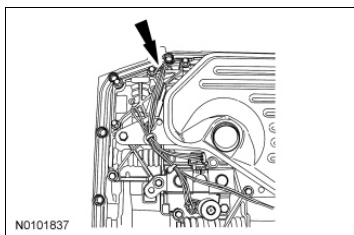


64. Install the transmission fluid filter and seal assembly.

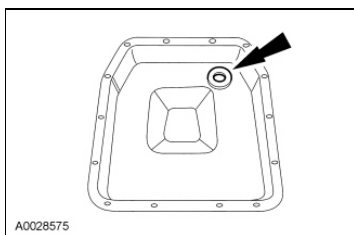


65. **NOTICE:** The transmission internal wire harness needs to be properly routed to avoid the potential of damage to the harness. Pinched or trapped wires may result in a transmission failure.

Make sure that the internal wire harness is properly routed.



66. Position the pan magnet into the transmission fluid pan.

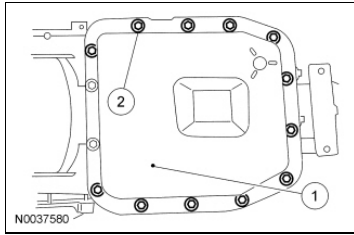


67. **NOTE:** The transmission fluid pan gasket is reusable. Clean and inspect for damage. If not damaged, the transmission fluid pan gasket should be reused.

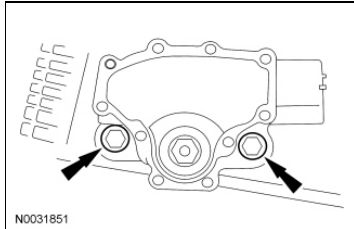
Install the transmission fluid pan and gasket.

1. Position the transmission fluid pan and transmission fluid pan gasket in place.
2. Install the transmission fluid pan bolts.
  - ◆ Tighten to 14 Nm (124 lb-in).





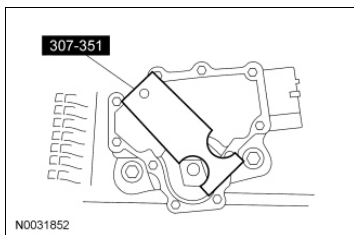
68. Loosely install the Transmission Range (TR) sensor and bolts.



69. **NOTE:** The TR Sensor Alignment Gauge is designed to fit snugly.

**NOTE:** The manual control lever must be in the NEUTRAL position.

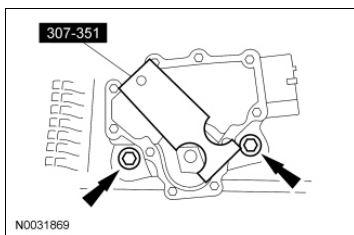
Using the TR Sensor Alignment Gauge, align the TR sensor slots.



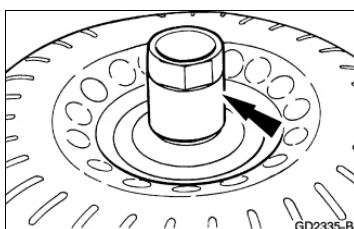
70. **NOTICE:** Tightening one screw before tightening the other may cause the sensor to bind or become damaged.

Tighten the bolts in an alternating sequence.

- Tighten to 9 Nm (80 lb-in).



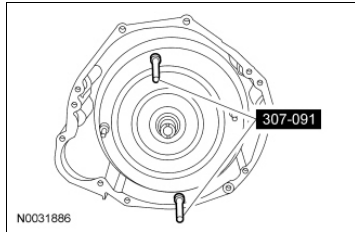
71. Lightly lubricate the converter hub with transmission fluid.



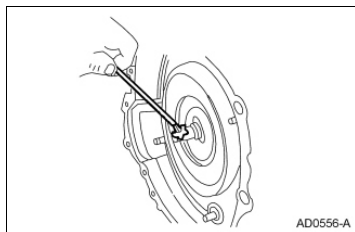
72. **NOTICE:** Make sure the converter hub is fully engaged in the front pump support and gear and rotates freely. Do not damage the hub seal.

**NOTICE:** If the torque converter slides out, the hub seal may be damaged.

Using the Torque Converter Handles, install the torque converter.



73. Lubricate the torque converter pilot hub with multi-purpose grease.




SECTION 307-01: Automatic Transaxle/Transmission -  
4R70E/4R75E  
INSTALLATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

## Transmission

### Special Tool(s)

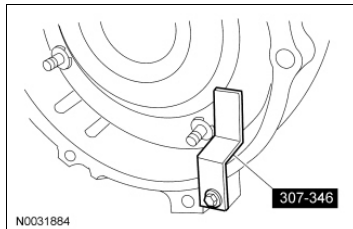
 ST1636-A	Retainer, Torque Converter 307-346 (T97T-7902-A)
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### Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLVC	MERCON® LV
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B

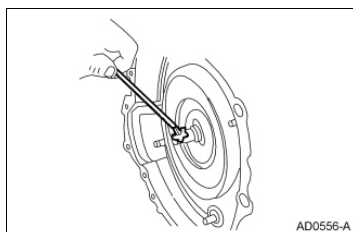
1. **⚠ WARNING:** Secure the torque converter in the transmission during removal or installation. The torque converter is heavy and may result in injury if it falls out of the transmission. Failure to follow this instruction may result in serious personal injury.

Install the Torque Converter Retainer.

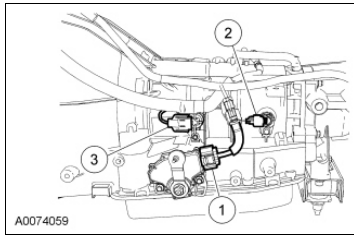


2. Position and secure the transmission on a suitable high-lift transmission jack.
3. **NOTICE:** Prior to installation of the transmission, the torque converter pilot hub must be lubricated with multi-purpose grease or damage to the torque converter or the engine crankshaft can occur.

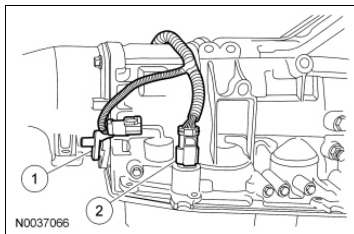
Lubricate the torque converter pilot hub with multi-purpose grease.



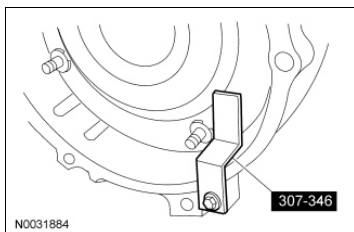
4. Connect the electrical connectors and install the wire harness on the transmission.
  1. Connect the Transmission Range (TR) sensor connector.
  2. Connect the Output Shaft Speed (OSS) and Turbine Shaft Speed (TSS) sensor connectors.
  3. Install the catalyst monitor connector retainer to the stud.
    - ◆ Connect the wire harness retainers.



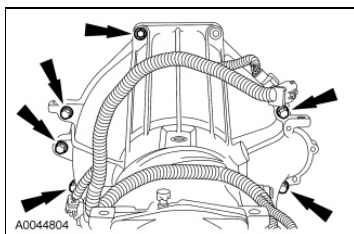
5. Connect the electrical connectors.
  1. Install the catalyst monitor connector retainer to the stud.
  2. Connect the transmission vehicle harness connector.



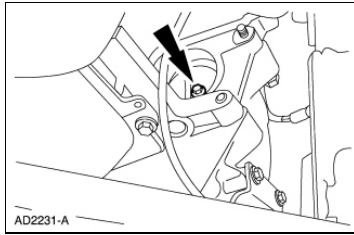
6. Raise and position the transmission to the engine.
  - Align the balancing marks on the torque converter stud and the flexplate bolt hole.
7. Remove the Torque Converter Retainer.



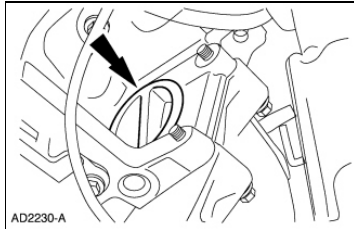
8. Install 6 transmission retaining bolts.
  - Tighten to 48 Nm (35 lb-ft).



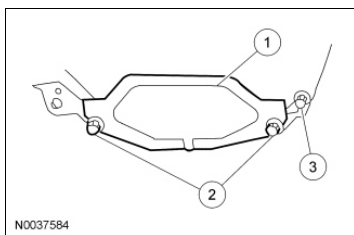
9. Install 4 new torque converter nuts.
  - Tighten to 36 Nm (27 lb-ft).



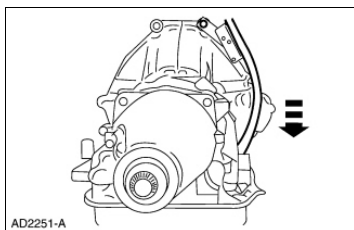
10. Install the rubber access plug.



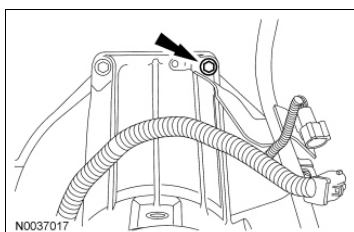
11. Install the transmission inspection cover.
1. Position the transmission inspection cover.
  2. Install the 2 bolts.
    - ◆ Tighten to 35 Nm (26 lb-ft).
  3. Install the bolt for the separator plate.
    - ◆ Tighten to 35 Nm (26 lb-ft).



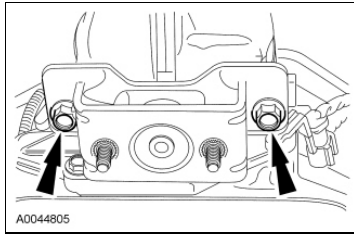
12. Install the transmission filler tube.



13. Install the transmission filler tube bolt.
- Tighten to 48 Nm (35 lb-ft).



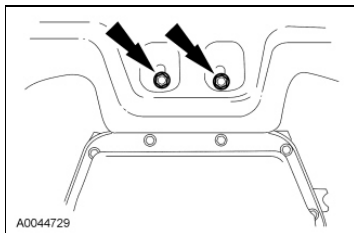
14. Install the transmission insulator and retainer.
- Tighten to 90 Nm (66 lb-ft).



15. Install the transmission support crossmember. For additional information, refer to Transmission Support Crossmember in this section.

16. Lower the transmission onto the transmission support crossmember and install the transmission insulator and retainer nuts.

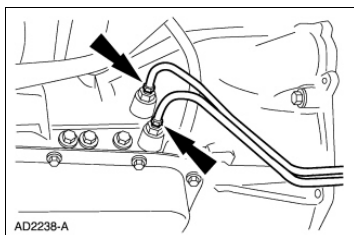
- Tighten to 30 Nm (22 lb-ft).



17. Remove the high-lift transmission jack.

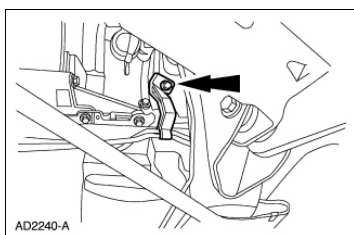
18. Install the transmission fluid cooler tubes.

- Tighten to 20 Nm (177 lb-in).

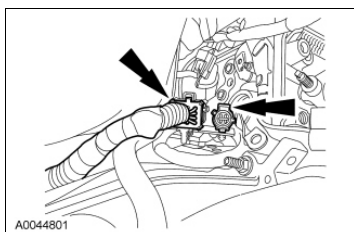


19. Install the transmission fluid cooler tube bracket.

- Tighten to 15 Nm (133 lb-in).

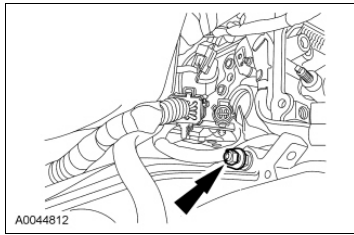


20. Connect the transmission harness connectors to the transmission filler tube bracket.



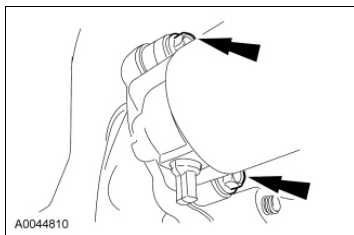
21. Install the ground wire.

- Tighten to 23 Nm (17 lb-ft).



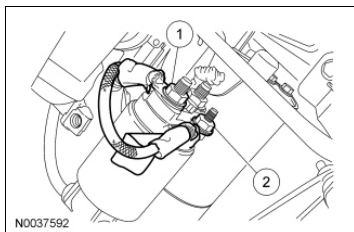
22. Install the starter and the bolts.

- Tighten to 25 Nm (18 lb-ft).

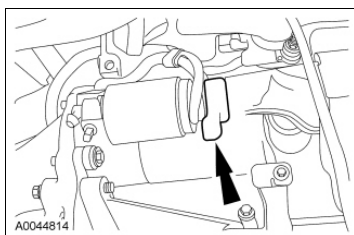


23. Connect the electrical connectors on the starter.

1. Tighten the starter B+ cable to 12 Nm (106 lb-in).
2. Tighten the starter solenoid nut to 6 Nm (53 lb-in).



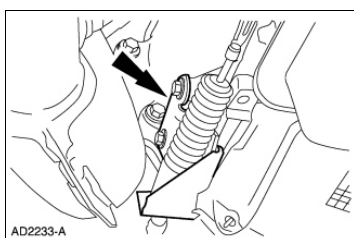
24. Install the starter motor electrical connector cap.



25. Install the exhaust system. Refer to section Section 309-00 .

26. Install the selector lever cable bracket.

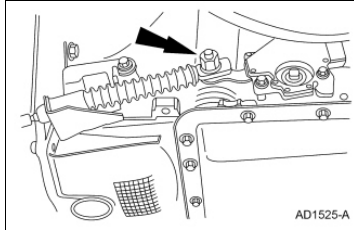
- Tighten to 14 Nm (124 lb-in).



27. **NOTE:** The manual control lever must be in the (D) position.

Slide the transmission selector lever into the selector lever cable bracket until the tabs fully seat, and connect the selector lever cable and nut to the manual control lever.

- Tighten to 30 Nm (22 lb-ft).



28. Install the driveshaft. For additional information, refer to Section 205-01 .

29. Connect the battery ground cable. For additional information, refer to Section 414-01 .

30. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Fill the transmission with transmission fluid and inspect for correct operation.

---



## Material

Item	Specification	Fill Capacity
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLV	MERCON® LV	Police applications 12.1L (12.8 qt) Non-Police applications 13.1L (13.9 qt)

## Torque Specifications

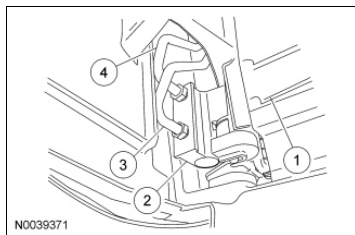
Description	Nm	lb-in
Transmission fluid cooler tube bracket-to-A/C compressor nut	9	80
Transmission fluid cooler tube bracket-to-engine bolt	15	133
Transmission fluid cooler tube nuts	20	177

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## Transmission Cooling

The transmission fluid cooler contains a thermostatic bypass valve and is part of the A/C condenser core, with the bottom rows of the A/C condenser being used as the transmission fluid cooler. The transmission fluid cooler cannot be serviced separately.

- When the transmission fluid is cold the thermostatic bypass valve is closed and will not allow transmission fluid to circulate through the transmission fluid cooler.
- As the Transmission Fluid Temperature (TFT) increases, the thermostatic bypass valve opens and allows transmission fluid to circulate through the transmission fluid cooler.



Item	Part Number	Description
1	19712	A/C condenser core
2	-	Transmission fluid cooler
3	7A030	Transmission fluid cooler inlet tube
4	7A031	Transmission fluid cooler outlet tube

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## Transmission Cooling

### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** The transmission fluid cooler is not repairable with existing equipment due to the thermostatic bypass valve. Do not attempt to backflush and clean the transmission fluid cooler. Install a new transmission fluid cooler if there is leakage from the transmission fluid cooler, major metallic failure, multiple clutch or clutch plate failure, or sufficient component wear that results in metallic contamination. Refer to Transmission Fluid Cooler in this section.

**NOTICE:** When internal wear/damage occurs in the transmission, metal particles, clutch plate material and band material can travel into the torque converter, the transmission fluid cooler tubes and the transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns. To prevent future concerns, remove these contaminants from the cooling system before placing the transmission back into use. Refer to Section 307-01 Transmission Fluid Cooler Tubes Backflushing and Cleaning and Torque Converter Contamination Inspection.

1. Visually inspect for obvious signs of mechanical damage, incorrect component installation and system leaks. Repair as necessary.
2. If the fault is not visually evident, GO to Symptom Chart - Transmission Cooling or GO to Symptom Chart - NVH.

### Symptom Chart - Transmission Cooling

Symptom Chart - Transmission Cooling

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

Condition	Possible Sources	Action
-----------	------------------	--------

- |   |  |  |
|---|--|--|
| • Vibration - a high frequency (20-80 Hz) that is felt through the seat or selector lever and changes with engine speed |  |  |
|---|--|--|

- Transmission fluid cooler tubes grounded out
  - CHECK the transmission fluid cooler tubes. REPAIR as necessary.
-

## Transmission Fluid Cooler Backflushing and Cleaning

1. **NOTICE:** When internal wear/damage occurs in the transmission, metal particles, clutch plate material and band material can travel into the torque converter and the transmission fluid cooler. These contaminants are a major cause of recurring transmission concerns. To prevent future concerns, remove these contaminants from the transmission cooling system before placing the transmission back into use.

Install a new transmission fluid cooler if there is leakage from the transmission fluid cooler, major metallic failure, multiple clutch or clutch plate failure, or sufficient component wear that results in metallic contamination. For additional information, refer to Transmission Fluid Cooler in this section. For Transmission Fluid Cooler Tubes Backflushing and Cleaning, refer to Section 307-01 .

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### **Transmission Fluid Cooler**

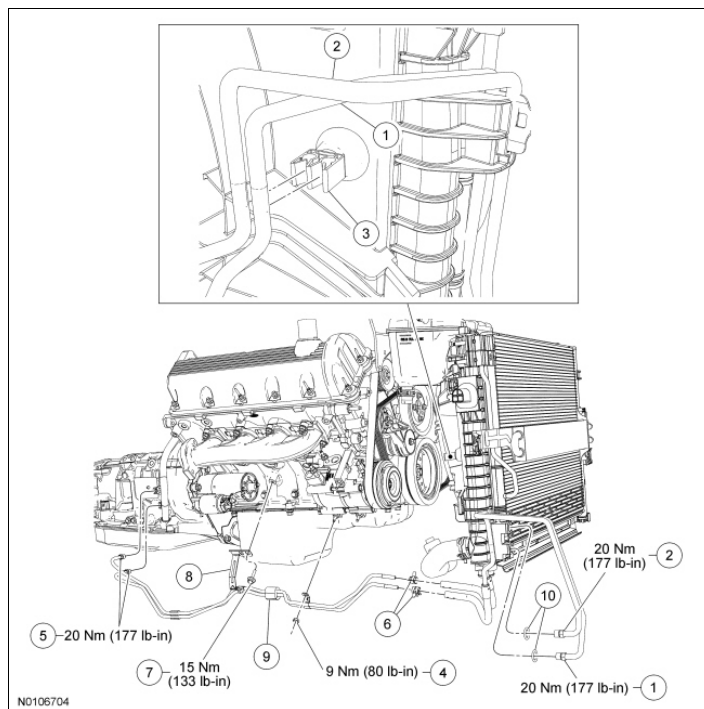
**NOTE:** The transmission fluid cooler is part of the A/C condenser core assembly and cannot be serviced separately.

1. If installation of a new fluid cooler is required, refer to Condenser Core in Section 412-01 .
-

**Transmission Fluid Cooler Tubes**

## Material

Item	Specification
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLV	MERCON® LV

**Transmission Fluid Cooler Tubes**

Item	Part Number	Description
1	7A030	Transmission fluid cooler inlet tube nut
2	7A031	Transmission fluid cooler outlet tube nut
3	7F140	Transmission fluid cooler tube retainer
4	W7041723	Transmission fluid cooler tube bracket-to-A/C compressor nut
5	7R081	Transmission fluid cooler tube nuts
6	8287	Clamps
7	-	Transmission fluid cooler tube bracket-to-engine bolt
8	7N291	Transmission fluid cooler tube bracket
9	9F276	Clip

10	19E889	O-rings
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**Removal and Installation**

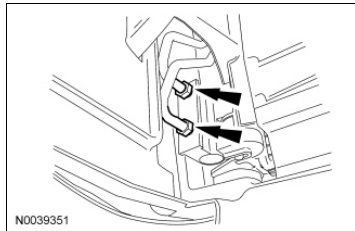
1. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

If equipped, turn the air suspension switch OFF.

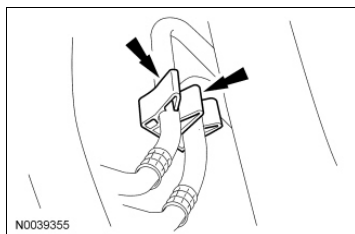
2. **⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A**.

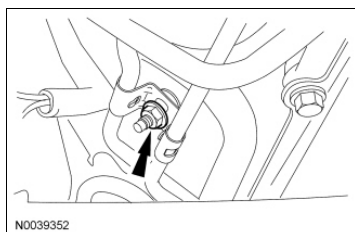
3. Disconnect each transmission fluid cooler tube from the transmission fluid cooler.
  - To install, tighten to 20 Nm (177 lb-in).



4. Disconnect the transmission fluid cooler tube(s) from the transmission fluid cooler tube retainer.

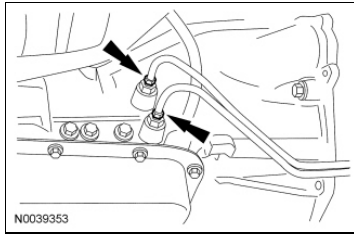


5. Remove the transmission fluid cooler tube bracket-to-A/C compressor nut.
  - To install, tighten to 9 Nm (80 lb-in).

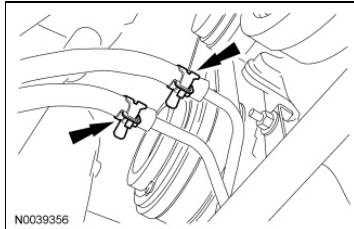


6. Disconnect each transmission fluid cooler tube from the transmission.
  - To install, tighten to 20 Nm (177 lb-in).

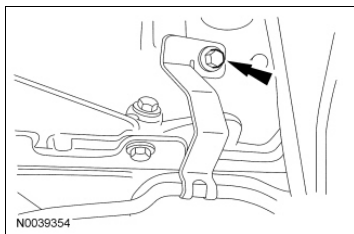




7. Disconnect the transmission fluid cooler hose(s) from the transmission fluid cooler tube(s).



8. Remove the bolt retaining the transmission fluid cooler tube bracket and remove the transmission fluid cooler tube(s).
  - To install, tighten to 15 Nm (133 lb-in).



9. **⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for **Important Safety Warnings**. Failure to follow this instruction may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, re-power the system.

- Fill the transmission to the correct level with transmission fluid. Inspect for leaks. For additional information, refer to Transmission Fluid Drain and Refill in Section 307-01.



SECTION 307-05: Automatic Transaxle/Transmission  
External Controls  
SPECIFICATIONS

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

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**Torque Specifications**

Description	Nm	lb-ft	lb-in
Clockspring mounting bracket bolts	8	-	71
Selector lever cable bracket bolts	28	21	-
Selector lever cable nut	30	22	-

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## External Controls

### Selector Lever Linkage

The selector lever linkage consists of:

- a selector lever, which connects to the transmission selector lever cable linkage.
  - ◆ A selector lever pin secures the selector lever to the selector lever linkage.
- a selector lever cable and selector lever cable bracket, which connects to the transmission selector lever arm and linkage on the steering column and to the manual control lever on the transmission.
  - ◆ The selector lever cable bracket bolts to the transmission.

### Brake Shift Interlock Actuator (BSIA)

The Brake Shift Interlock Actuator (BSIA) system consists of:

- a BSIA .
  - ◆ A selector lever position insert, which bolts to the steering column and secures the BSIA .
  - ◆ A contained PARK indicator switch.
- electrical circuits to supply power to unlock the BSIA .

The BSIA locks the selector lever in PARK:

- when the ignition switch lock cylinder is in the LOCK position.
- with the ignition switch lock cylinder in the RUN position and the brake pedal released.

The BSIA releases the selector lever:

- with the ignition switch lock cylinder in the RUN position with the brake pedal applied.

### Transmission Control Switch (TCS)


The Transmission Control Switch (TCS):

- is located on the end of the selector lever.
    - ◆ The TCS is not removable from the selector lever. Install a new selector lever if a new TCS is required.
  - is a momentary contact switch.
  - commands the PCM to disengage or engage the Overdrive (O/D) function of the transmission.
    - ◆ When O/D is disengaged, the message O/D OFF will illuminate on the Instrument Cluster (IC).
-



## External Controls

### Special Tool(s)

	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
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### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern by operating the transmission external control.
2. Visually inspect for obvious signs of mechanical and electrical damage, incorrect component installation and component misalignment. Verify that all circuit-related systems are functioning correctly. Refer to the following chart.

### DTC Chart

Five Digit DTC	Component	Description	Condition	Symptom	Action
B1485	Lighting Control Module (LCM), wiring	LCM concerns, shorted circuit	LCM system has a malfunction which may cause a Brake Shift Interlock Actuator (BSIA) concern.	BSIA not locking.	<u>GO to Pinpoint Test A</u> .

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Damaged Brake Shift Interlock Actuator (BSIA)</li> <li>• Damaged Brake Pedal Position (BPP) switch</li> <li>• Damaged Transmission Control Switch (TCS)</li> <li>• Damaged speed control deactivator switch</li> <li>• Damaged steering column</li> <li>• Damaged Instrument Cluster (IC)</li> <li>• Damaged selector lever cable and bracket</li> </ul>	<ul style="list-style-type: none"> <li>• Failed Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 26 (10A)</li> <li>◆ 28 (7.5A)</li> </ul> </li> <li>• Failed Battery Junction Box (BJB) fuse 14 (20A)</li> <li>• BSIA</li> <li>• Lighting Control Module (LCM)</li> <li>• PCM</li> <li>• ABS module</li> <li>• BJB</li> </ul>

	<ul style="list-style-type: none"> <li>• CJB</li> <li>• Damaged wiring harness</li> <li>• Loose connections or corroded terminals</li> </ul>
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3. If the fault is not visually evident, GO to Symptom Chart - External Controls .

## Symptom Chart - External Controls

Symptom Chart - External Controls

## Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

### ConditionPossible SourcesAction

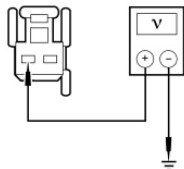
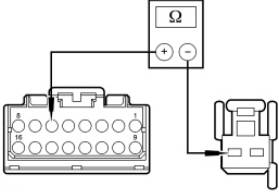
- Vibration - a high frequency (20-80 Hz) that is felt through the seat or selector lever and changes with engine speed
- Selector lever cable incorrectly routed, grounded out or loose
- CHECK the selector lever cable. REPAIR as necessary. REFER to Selector Lever Cable and Bracket in this section.
- Rattle, noise, buzz or other noise
- Selector lever
- Steering column shrouds
- INSPECT the selector lever and shrouds for damage and incorrect installation. REFER to Selector Lever in this section.

## Pinpoint Tests

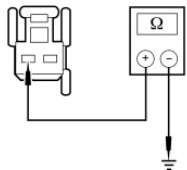
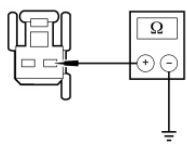
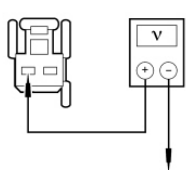
Refer to Wiring Diagrams Cell 29 , Transmission Controls for schematic and connector information.

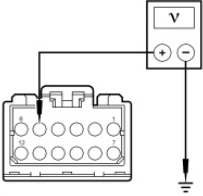
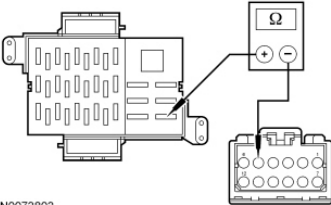
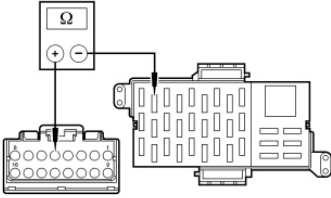
Refer to Wiring Diagrams Cell 37 , Shift Interlock for schematic and connector information.

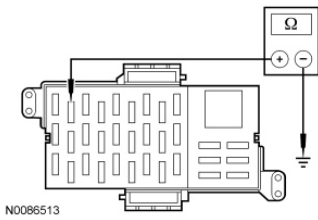
**PINPOINT TEST A: THE BSIA SYSTEM DOES NOT RELEASE/LOCK CORRECTLY**

Test Step	Result / Action to Take
<b>A1 CHECK FOR DTCs</b>	
<ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Ignition ON.</li> <li>• Check for the following DTCs: P1572, P1703 or B1484.</li> <li>• <b>Are any of these DTCs set?</b></li> </ul>	<p><b>Yes</b> For DTC P1572 or P1703, REFER to <u>Section 419-03</u> . For DTC B1484, REFER to <u>Section 206-09</u> .</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK CIRCUIT 810 (RD/LG) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Brake Shift Interlock Actuator (BSIA) C2008.</li> <li>• Measure the voltage between BSIA C2008-2, circuit 810 (RD/LG), harness side and ground, while applying and releasing the brake pedal.</li> </ul>  <p>N0055194</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts with the brake pedal applied and less than 5 volts with it released?</b></li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 CHECK CIRCUIT 810 (RD/LG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Lighting Control Module (LCM) C2145A.</li> <li>• Measure the resistance between BSIA C2008-2 and LCM C2145A-6, circuit 810 (RD/LG), harness side.</li> </ul>  <p>N0055193</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> REPAIR circuit 810 (RD/LG) for an open. If no open is found, GO to <u>A6</u> . RECONNECT all components. CLEAR DTCs. TEST the system for normal operation.</p>
<b>A4 CHECK CIRCUIT 810 (RD/LG) FOR A SHORT TO GROUND</b>	



<ul style="list-style-type: none"> <li>• Measure the resistance between BSIA C2008-2, circuit 810 (RD/LG), harness side and ground.</li> </ul>  <p>N0055192</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>A7</u> .</p> <p><b>No</b> REPAIR circuit 810 (RD/LG) for a short to ground. RECONNECT all components. CLEAR DTCs. TEST the system for normal operation.</p>
<b>A5 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between BSIA C2008-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0038110</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> REPLACE the BSIA . RECONNECT all components. CLEAR DTCs. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. RECONNECT all components. CLEAR DTCs. TEST the system for normal operation.</p>
<b>A6 CHECK CIRCUIT 810 (RD/LG) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between BSIA C2008-2, circuit 810 (RD/LG), harness side and ground.</li> </ul>  <p>N0055194</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> REPAIR circuit 810 (RD/LG) for a short to voltage. RECONNECT all components. CLEAR DTCs. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A7</u> .</p>
<b>A7 CHECK LCM BRAKE INPUT VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145B.</li> <li>• Measure the voltage between LCM C2145B-5 and ground while applying and releasing the brake pedal.</li> </ul>	<p><b>Yes</b> GO to <u>A9</u> .</p> <p><b>No</b> GO to <u>A8</u> .</p>

 <p>N0073802</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts with the brake pedal applied and less than 5 volts with it released?</li> </ul>	
<b>A8 CHECK CIRCUIT 1651 (WH/RD) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the output side of Central Junction Box (CJB) fuse 28 (7.5A) and the LCM C2145B-5, circuit 1651 (WH/RD), harness side.</li> </ul>  <p>N0073803</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b>          INSTALL a new LCM .          RECONNECT all components.          CLEAR DTCs. TEST the system for normal operation.</p> <p><b>No</b>          REPAIR circuit 1651 (WH/RD) for an open. RECONNECT all components.          CLEAR DTCs. TEST the system for normal operation.</p>
<b>A9 CHECK CIRCUIT 640 (RD/YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the output side of CJB fuse 26 (10A) and the LCM C2145A-5, circuit 640 (RD/YE), harness side.</li> </ul>  <p>N0086512</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b>          GO to <u>A10</u> .</p> <p><b>No</b>          REPAIR circuit 1651 (WH/RD) for an open. RECONNECT all components.          CLEAR DTCs. TEST the system for normal operation.</p>
<b>A10 CHECK CIRCUIT 640 (RD/YE) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the output side of CJB fuse 26 (10A) and ground.</li> </ul>	<p><b>Yes</b>          INSTALL a new LCM .          RECONNECT all components.          CLEAR DTCs. TEST the system for normal operation.</p> <p><b>No</b>          REPAIR circuit 640 (RD/YE) for a short to ground. RECONNECT all components. CLEAR DTCs. TEST the system for normal operation.</p>



- Is the resistance greater than 10,000 ohms?

## PINPOINT TEST B: THE SELECTOR LEVER IS OUT OF CORRECT GEAR RELATIONSHIP

Test Step	Result / Action to Take
<b>B1 CHECK THE SELECTOR LEVER COMPONENTS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Gain access to the shift control components.</li> <li>• Ignition In ACC.</li> <li>• Apply the brake pedal.</li> <li>• Observe all shift control components while moving the selector lever through all ranges.</li> <li>• <b>Are any of the components damaged?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. REINSTALL all components. TEST the system for normal operation. If equipped with fire suppression system, GO to <u>B6</u> .</p> <p><b>No</b> GO to <u>B2</u> .</p>
<b>B2 CHECK THE SELECTOR LEVER CABLE AND BRACKET INSTALLATION</b>	
<ul style="list-style-type: none"> <li>• Check to make sure the selector lever cable and bracket installation is correct. Refer to <u>Selector Lever Cable and Bracket</u> in this section.</li> <li>• <b>Is the selector lever cable and bracket installed correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> REINSTALL the selector lever cable. GO to <u>B3</u> .</p>
<b>B3 CHECK THE SELECTOR LEVER CABLE ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Check to make sure the selector lever cable adjustment is correct. Refer to <u>Selector Lever Cable Adjustment</u> in this section.</li> <li>• <b>Is the selector lever cable adjusted correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>B4</u> .</p> <p><b>No</b> ADJUST the selector lever cable. GO to <u>B4</u> .</p>
<b>B4 CHECK THE SELECTOR LEVER INDICATOR ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Check to make sure the selector lever indicator adjustment is correct. Refer to <u>Selector Lever Indicator Adjustment</u> in this section.</li> <li>• <b>Is the selector lever indicator adjusted correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>B5</u> .</p> <p><b>No</b> ADJUST the selector lever indicator. GO to <u>B5</u> .</p>

<b>B5 CHECK THE TR SENSOR ADJUSTMENT</b>	
<ul style="list-style-type: none"> <li>• Check to make sure the Transmission Range (TR) sensor adjustment is correct. Refer to <u>Section 307-01</u> , Transmission Range (TR) Sensor Adjustment.</li> <li>• <b>Is the TR sensor adjusted correctly?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 307-01</u> . If equipped with fire suppression system, GO to <u>B6</u> .</p> <p><b>No</b> ADJUST the TR sensor. TEST the system for normal operation. If the condition persists, REFER to <u>Section 307-01</u> Diagnosis By Symptom. If equipped with fire suppression system, GO to <u>B6</u> .</p>
<b>B6 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 100-02B</u> . Failure to follow these instructions may result in serious personal injury.</b></li> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> , Fire Suppression System Depowering and Repowering.</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for Fire Suppression System Depowering and Repowering procedure.</p>

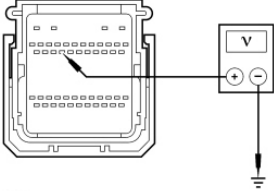
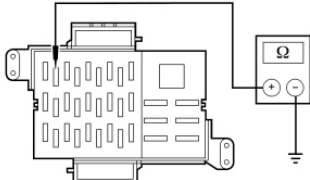
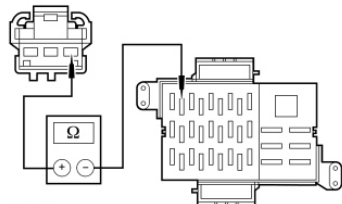
**PINPOINT TEST C: THE SELECTOR LEVER IS BINDING**

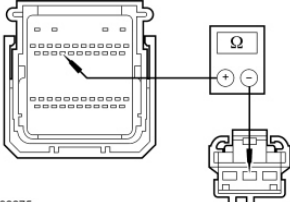
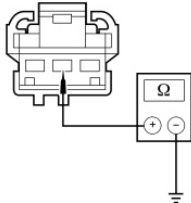
Test Step	Result / Action to Take
<b>C1 CHECK THE SELECTOR LEVER COMPONENTS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 100-02B</u> . Failure to follow the instructions may result in serious personal injury.</b></li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Gain access to the shift control components.</li> <li>• Ignition In ACC.</li> <li>• Apply the brake pedal.</li> <li>• Observe all shift control components while attempting to shift the selector lever through all ranges.</li> <li>• <b>Are any of the components damaged?</b></li> </ul>	<p><b>Yes</b> REPAIR as necessary. REINSTALL all components. TEST the system for normal operation. If equipped with fire suppression system, GO to <u>C4</u> .</p> <p><b>No</b> GO to <u>C2</u> .</p>
<b>C2 CHECK THE SHIFT CONTROL COMPONENT OPERATION WITH THE SELECTOR LEVER CABLE DISCONNECTED FROM THE TRANSMISSION</b>	
	<b>Yes</b>

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• With the vehicle in NEUTRAL, position it on a hoist. Refer to <u>Section 100-02A</u> .</li> <li>• Disconnect the selector lever cable from the manual control lever.</li> <li>• Lower the vehicle.</li> <li>• Ignition In ACC.</li> <li>• Apply the brake pedal.</li> <li>• Observe the shift control components while attempting to shift the selector lever through all ranges.</li> <li>• <b>Do the components move freely through all ranges?</b></li> </ul>	<p>REFER to <u>Section 307-01</u> , Diagnosis By Symptom. If equipped with fire suppression system, GO to <u>C4</u> .</p> <p><b>No</b> GO to <u>C3</u> .</p>
<b>C3 CHECK THE SHIFT CONTROL COMPONENT OPERATION WITH THE SELECTOR LEVER CABLE DISCONNECTED FROM THE STEERING COLUMN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the selector lever cable from the transmission selector lever arm and support.</li> <li>• Ignition In ACC.</li> <li>• Apply the brake pedal.</li> <li>• Observe the shift control components while attempting to shift the selector lever through all ranges.</li> <li>• <b>Do the components move freely through all ranges?</b></li> </ul>	<p><b>Yes</b> INSTALL a new selector lever cable and bracket. REFER to <u>Selector Lever Cable and Bracket</u> in this section. TEST the system for normal operation. If equipped with fire suppression system, GO to <u>C4</u> .</p> <p><b>No</b> REFER to <u>Section 211-04</u> for steering column repair. If equipped with fire suppression system, GO to <u>C4</u> .</p>
<b>C4 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• <b>⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 100-02B</u> . Failure to follow these instructions may result in serious personal injury.</b></li> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> , Fire Suppression System Depowering and Repowering.</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowered is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> for Fire Suppression System Depowering and Depowering procedure.</p>

**PINPOINT TEST D: THE TCS DOES NOT OPERATE CORRECTLY**

Test Step	Result / Action to Take
<b>D1 CHECK CJB FUSE 26 (10A)</b>	
<ul style="list-style-type: none"> <li>• Check fuse: Central Junction Box (CJB) 26 (10A).</li> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> GO to <u>D3</u> .</p>
<b>D2 CHECK TCS SYSTEM</b>	

<ul style="list-style-type: none"> <li>• Disconnect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between PCM C175B-29 and ground while cycling the Transmission Control Switch (TCS).</li> </ul>  <p>N0086534</p> <ul style="list-style-type: none"> <li>• Does the voltage cycle from 0 volt to 12 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new PCM, REFER to <u>Section 303-14</u> . RECONNECT all components. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>D3</u> .</p>
<p><b>D3 CHECK CIRCUIT 640 (RD/YE) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: CJB Fuse 26 (10A).</li> <li>• Disconnect: PCM C175B.</li> <li>• Disconnect: TCS C279.</li> <li>• Measure the resistance between the output side of CJB fuse 26 (10A) and ground.</li> </ul>  <p>N0038870</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D4</u> .</p> <p><b>No</b> REPAIR circuit 640 (RD/YE) for a short to ground. REINSTALL all components. TEST the system for normal operation.</p>
<p><b>D4 CHECK CIRCUIT 640 (RD/YE) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the output side of CJB fuse 26 (10A) and TCS C279-1, circuit 640 (RD/YE), harness side.</li> </ul>  <p>N0038871</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D5</u> .</p> <p><b>No</b> REPAIR circuit 640 (RD/YE) for an open. RECONNECT all components. TEST the system for normal operation.</p>

<b>D5 CHECK CIRCUIT 224 (TN/WH) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between TCS C279-2 and PCM C175B-29, circuit 224 (TN/WH), harness side.</li> </ul>  <p>N0038875</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D6</u> .</p> <p><b>No</b> REPAIR circuit 224 (TN/WH) for an open. RECONNECT all components. TEST the system for normal operation.</p>
<b>D6 CHECK CIRCUIT 224 (TN/WH) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between TCS C279-2, circuit 224 (TN/WH), harness side and ground.</li> </ul>  <p>N0038874</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new selector lever. REFER to <u>Selector Lever</u> in this section. RECONNECT all components. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 224 (TN/WH) for a short to ground. RECONNECT all components. TEST the system for normal operation.</p>





**Selector Lever Cable Adjustment**

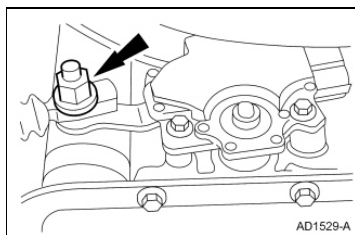
1. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

If equipped, turn the air suspension switch to the OFF position.

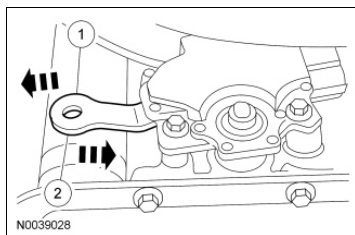
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

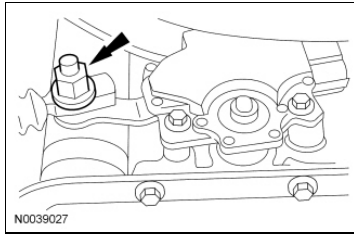
3. Place the selector lever in the (D) position.
4. Hang a 1.4 kg (3 lb) weight on the selector lever.
5. Remove the nut, and disconnect the selector lever cable from the manual control lever.



6. Position the manual control lever in the (D) position.
  1. Pull the manual control lever forward until travel stops.
  2. Push the manual control lever backward 2 detents to the (D) position.



7. Connect the selector lever cable to the manual control lever, and install the nut.
  - Tighten to 30 Nm (22 lb-ft).



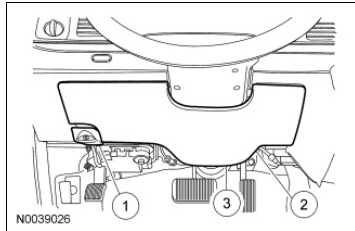
8. Remove the 1.4 kg (3 lb) weight.
9. Move the selector lever from detent to detent and compare it with the transmission setting. Verify that the engine will start in PARK and NEUTRAL and that the reversing lamps illuminate in REVERSE. If not, repeat the adjustment procedure.
10. Check that the Transmission Range (TR) sensor adjustment is correct. For additional information, refer to [Section 307-01](#) . Adjust the TR sensor if necessary.
11. After completing all adjustments, and with the vehicle on the ground, turn on the electrical power to the air suspension, if equipped.
12. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system. For additional information, refer to [Section 100-02B](#) , Fire Suppression System Depowering and Repowering.

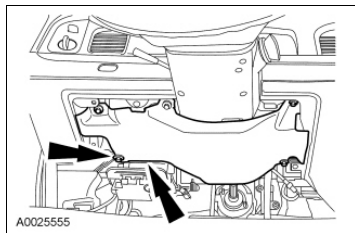
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## Selector Lever Indicator Adjustment

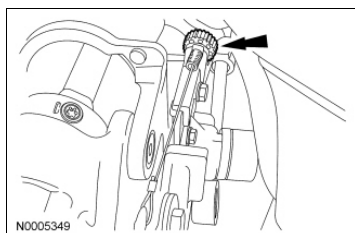
1. Remove the lower steering column opening finish panel.
  1. Remove the screw and position the parking brake release handle aside.
  2. Remove the screw from the lower steering column opening finish panel.
  3. Pull outward to release the retaining clips and remove the lower steering column opening finish panel.



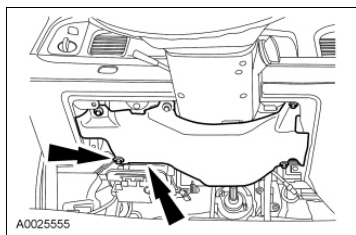
2. Remove the 5 screws and the lower steering column opening finish panel reinforcement.



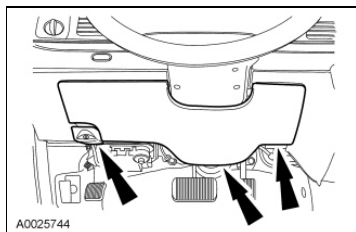
3. Rotate the selector lever clockwise until it bottoms out (1st gear), then rotate it counterclockwise 2 detents ((D) position).
4. Hang a 1.4 kg (3 lb) weight on the gearshift.
5. Rotate the thumbwheel to center the selector lever indicator in the middle of the (D) position.



6. Remove the 1.4 kg (3 lb) weight.
7. Rotate the selector lever into each detent to verify that the selector lever indicator matches the selected range. Readjust, if necessary.
8. Install the lower steering column opening finish panel reinforcement.



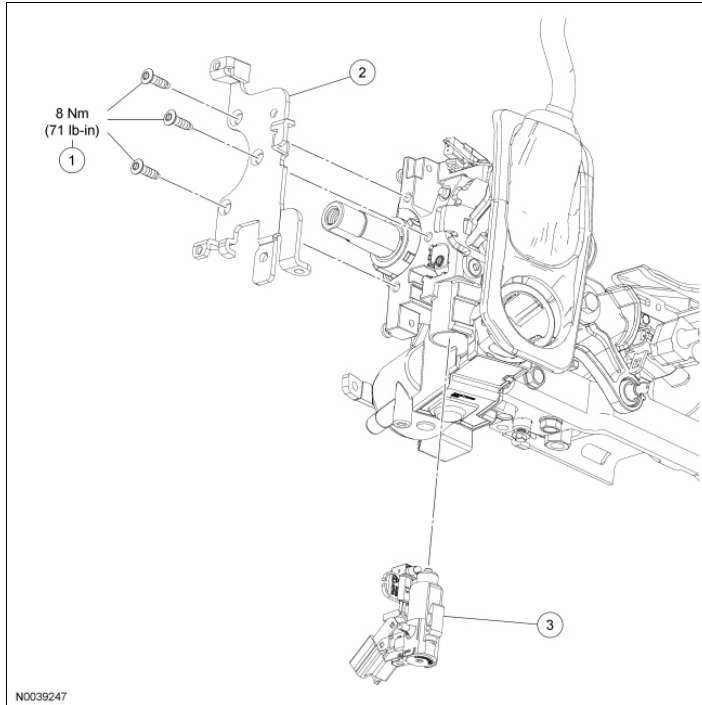
9. Install the lower steering column opening finish panel and parking brake release handle.



SECTION 307-05: Automatic Transaxle/Transmission  
 External Controls  
 REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

### Brake Shift Interlock Actuator



Item	Part Number	Description
1	3F907	Clockspring mounting bracket bolts
2	3678	Clockspring mounting bracket
3	3F770	Brake Shift Interlock Actuator (BSIA)

### Removal and Installation

- ⚠ WARNING:** Always deplete the backup power supply before repairing or installing any new front or side air bag supplemental restraint system (SRS) component and before servicing, removing, installing, adjusting or striking components near the front or side impact sensors or the restraints control module (RCM). Nearby components include doors, instrument panel, console, door latches, strikers, seats and hood latches.

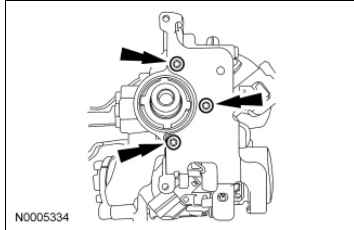
Refer to the Description and Operation portion of Section 501-20B for location of the RCM and impact sensor(s).

To deplete the backup power supply energy, disconnect the battery ground cable and wait at least 1 minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

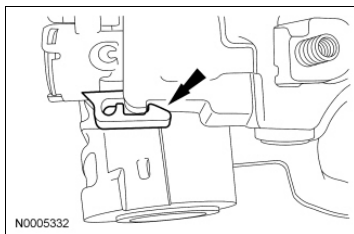
**Failure to follow these instructions may result in serious personal injury or death in the event of an accidental deployment.**

Disconnect the battery ground cable. Wait at least one minute before proceeding with the procedure to allow the backup power supply to deplete its energy. For additional information, refer to Section 414-01.

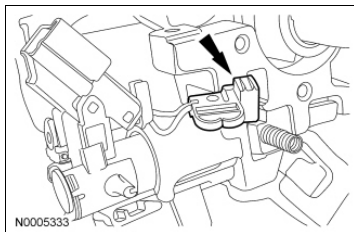
2. Remove the Supplemental Restraint System (SRS) steering column clockspring. For additional information, refer to [Section 501-20B](#) .
3. Remove the 3 clockspring mounting bracket bolts and remove the clockspring mounting bracket from the steering column.
  - To install, tighten to 8 Nm (71 lb-in).



4. Release the clip retaining the Brake Shift Interlock Actuator (BSIA) and slide the BSIA down.



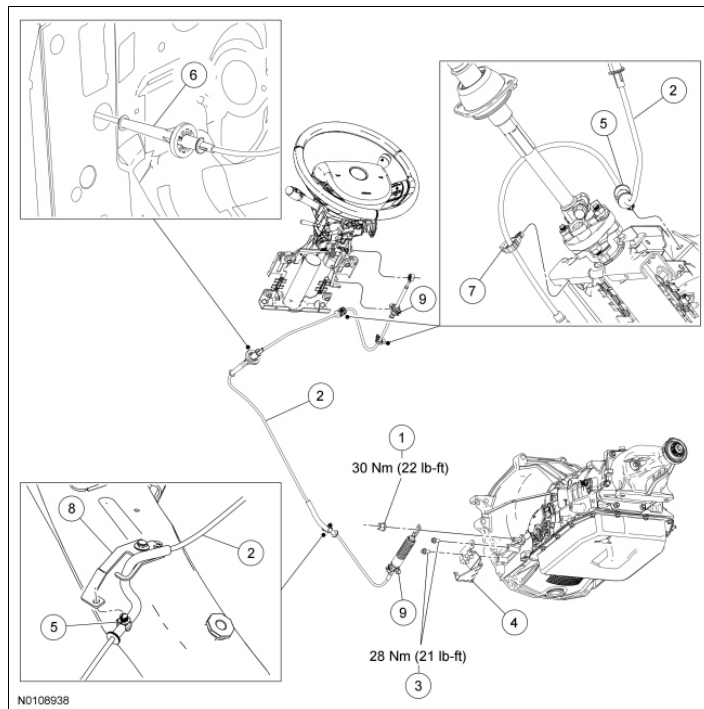
5. Remove the park position switch from the cavity and remove the BSIA assembly.



6. To install the BSIA , reverse the removal procedure.



### Selector Lever Cable and Bracket



Item	Part Number	Description
1	N808356	Selector lever cable nut
2	7E395	Selector lever cable
3	-	Selector lever cable bracket bolts
4	7B229	Selector lever cable bracket
5	13A506	Selector lever cable retainer
6	-	Rubber grommet
7	57719	Retainer
8	7B229	Selector lever cable routing assist bracket
9	7H181	Selector lever cable retainer

#### Removal

- ⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

If equipped, turn the air suspension switch to the OFF position.

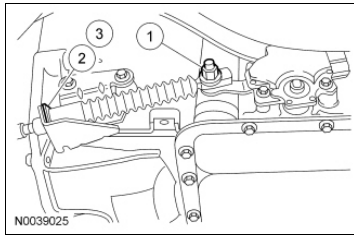
- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .



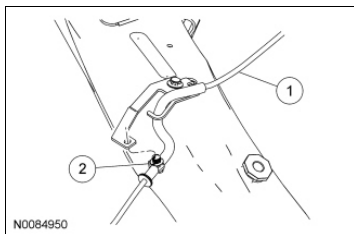
3. Disconnect the selector lever cable from the transmission.

1. Remove the selector lever cable-to-manual control lever retaining nut and disconnect the selector lever cable from the manual control lever.
2. Disconnect the selector lever cable from the selector lever cable bracket.
3. Remove and discard the selector lever cable retainer.



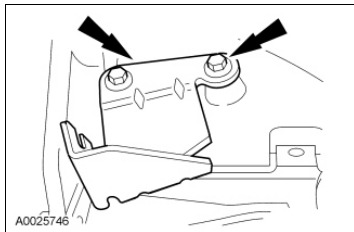
4. Unclip the selector lever cable from the selector lever cable routing assist bracket that attaches to the frame and routes the selector lever cable upward toward the top of the engine compartment.

1. Unhook the selector lever cable from the selector lever cable routing assist bracket.
2. Unhook the selector lever cable retainer.



5. Unclip the selector lever cable from the clips that route the cable upward toward the top of the engine compartment.

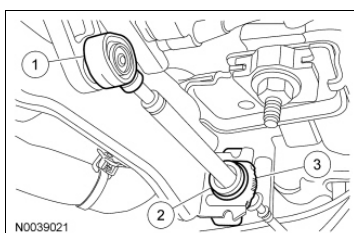
6. Remove the bolts and the selector lever cable bracket from the transmission.



7. From the engine compartment, unclip the selector lever cable from the clip that routes the selector lever cable toward the bulkhead.

8. Disconnect the selector lever cable from the steering column.

1. Disconnect the selector lever cable from the transmission selector lever arm ball stud and support.
2. Disconnect the selector lever cable from the steering column bracket.
3. Remove and discard the selector lever cable retainer.



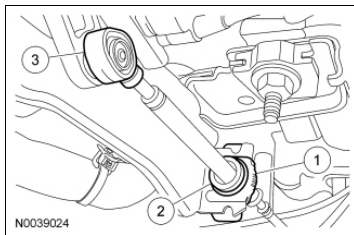
9. From the engine compartment, use a suitable tool to push the rubber grommet through the bulkhead.
10. From the passenger compartment, remove the selector lever cable from the vehicle.

### Installation

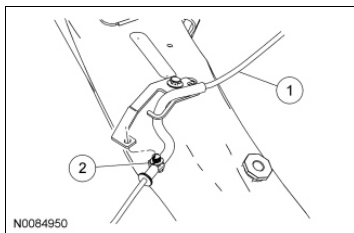
1. From inside the vehicle, feed the selector lever cable through the opening in the bulkhead and downward toward the transmission.
2. Seat the selector lever cable rubber grommet in the bulkhead opening.
3. **NOTE:** When installing the selector lever cable, make sure that the selector lever cable locking tabs are locked in place and the cable end is snapped onto the ball stud. Press the selector lever cable into the bracket and listen for the cable to click in place. Pull back on the selector lever cable to make sure that it is locked into the bracket. Also make sure that the selector lever cable end is correctly installed onto the ball stud. Pull back on the selector lever cable end to make sure that the cable end is correctly installed.

Connect the selector lever cable to the steering column.

1. Install the new selector lever cable retainer.
2. Connect the selector lever cable to the steering column bracket.
3. Connect the selector lever cable to the transmission selector lever arm ball stud and support.

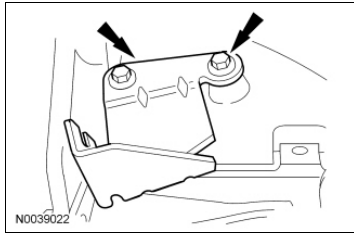


4. Place the selector lever in the (D) position.
5. Hang a 1.4 kg (3 lb) weight on the selector lever.
6. From the engine compartment, clip the selector lever cable to the clip that routes the cable toward the bulkhead.
7. Route the selector lever cable through the selector lever cable routing assist bracket.
  1. Route the selector lever cable downward toward the bottom of the engine compartment through the selector lever cable routing assist bracket.
  2. Clip the selector lever cable retainer to the selector lever routing assist bracket that is attached to the frame and routes the cable downward.



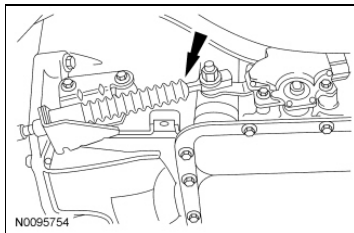
8. Position the selector lever cable bracket and install the selector lever cable bracket-to-transmission retaining bolts.

- Tighten to 28 Nm (21 lb-ft).



9. **NOTE:** Verify that the selector lever cable boot extends out to the terminal end of the cable prior to fastening it to the transmission. The boot must be tie-strapped to the slotted terminal that attaches to the ball stud.

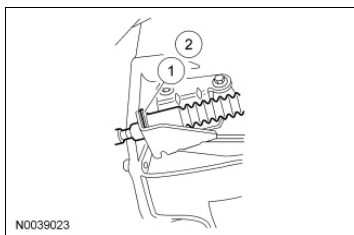
If required, install a new tie-strap.



10. **NOTE:** When installing the selector lever cable, make sure that the selector lever cable locking tabs are locked in place and the cable end is snapped onto the ball stud. Press the selector lever cable into the bracket and listen for the cable to click in place. Pull back on the selector lever cable to make sure that it is locked into the bracket. Also make sure that the selector lever cable end is correctly installed onto the ball stud. Pull back on the selector lever cable end to make sure that the cable end is correctly installed.

Connect the selector lever cable to the selector lever cable bracket. Do not connect the selector lever cable to the manual control lever at this time.

1. Install the new selector lever cable retainer clip.
2. Connect the selector lever cable to the shift cable bracket.



11. Clip the selector lever cable to the clips that route the cable upward toward the top of the engine compartment.
12. Adjust the selector lever cable. For additional information, refer to Selector Lever Cable Adjustment in this section.
13. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

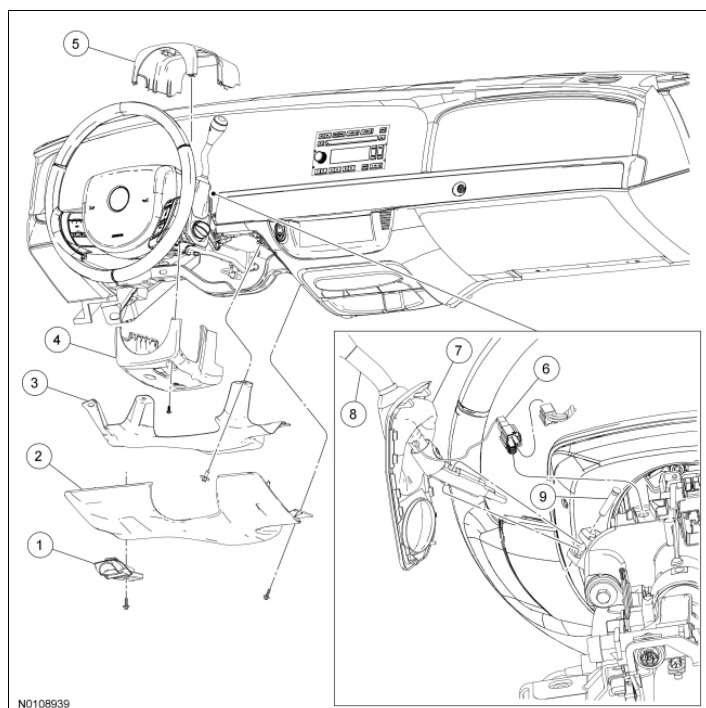
If equipped with a fire suppression system, repower the system. For additional information, refer to Section 100-02B, Fire Suppression System Depowering and Repowering.

14. After completing all adjustments, and with the vehicle on the ground, turn on the electrical power to the air suspension, if so equipped.
  15. Remove the 1.4 kg (3 lb) weight from the selector lever.
-

SECTION 307-05: Automatic Transaxle/Transmission  
 External Controls  
 REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
 Workshop Manual  
 Procedure revision date: 08/19/2009

## Selector Lever



Item	Part Number	Description
1	2B658	Park brake release handle
2	5404459	Steering column opening finish panel
3	5404502	Finish panel reinforcement
4	3533	Lower steering column shroud
5	3530	Upper steering column shroud
6	14A624	Transmission Control Switch (TCS) electrical connector
7	-	Selector lever cover
8	7202	Selector lever
9	W710559S900	Selector lever pin

### Removal and Installation

- ⚠ WARNING:** Always deplete the backup power supply before repairing or installing any new front or side air bag supplemental restraint system (SRS) component and before servicing, removing, installing, adjusting or striking components near the front or side impact sensors or the restraints control module (RCM). Nearby components include doors, instrument panel, console, door latches, strikers, seats and hood latches.

Refer to the Description and Operation portion of Section 501-20B for location of the RCM and impact sensor(s).

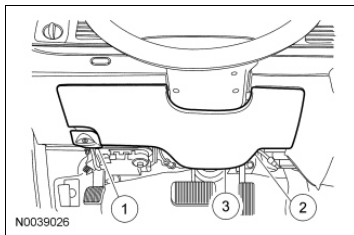
To deplete the backup power supply energy, disconnect the battery ground cable and wait at least 1 minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped).

**Failure to follow these instructions may result in serious personal injury or death in the event of an accidental deployment.**

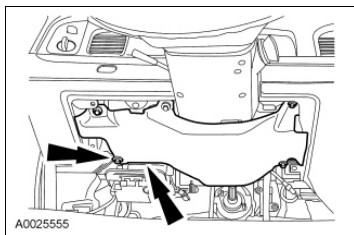
Disconnect the battery ground cable. Wait at least one minute before proceeding with the procedure to allow the backup power supply to deplete its energy. For additional information, refer to [Section 414-01](#).

2. Remove the lower steering column opening finish panel.

1. Remove the screw and position the park brake release handle aside.
2. Remove the screw from the lower steering column opening finish panel.
3. Pull outward to release the retaining clips and remove the lower steering column opening finish panel.

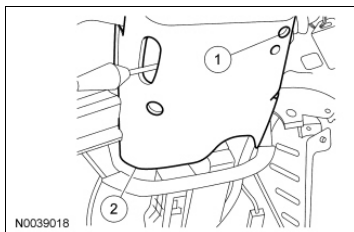


3. Remove the 5 screws and the lower steering column opening finish panel reinforcement.

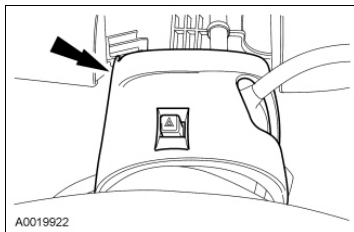


4. Remove the lower steering column shroud.

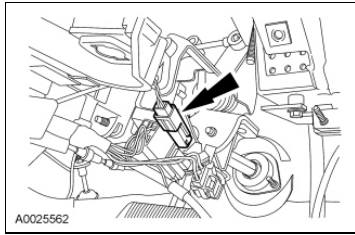
1. Remove the 3 screws.
2. Remove the lower steering column shroud.



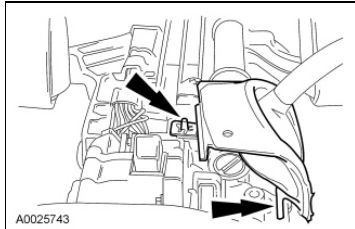
5. Remove the upper steering column shroud.



6. Disconnect the TCS harness connector.

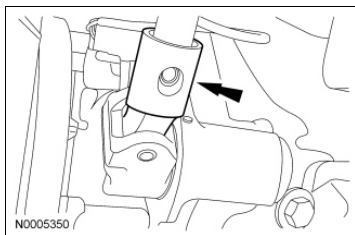


7. Separate the TCS harness from the locators and the selector lever cover from the steering column.



8. **NOTICE:** Removing the selector lever pin will damage the pin. Never reinstall the old selector lever pin.

Remove the selector lever pin and the selector lever. Discard the selector lever pin.



9. To install the selector lever, reverse the removal procedure.

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-ft</b>	<b>lb-in</b>
Catalytic converter-to-exhaust inlet pipe bolt	40	30	-
Catalytic converter-to-exhaust manifold nuts	40	30	-
Catalytic converter-to-exhaust manifold studs	40	30	-
Catalytic converter-to-outlet pipe bolts	40	30	-
Exhaust clamp nuts	48	35	-
Service muffler-to-service tailpipe fasteners	33	24	-
Worm gear clamp	7	-	62

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## Exhaust System

**NOTICE:** When servicing the exhaust system or removing exhaust components, disconnect all Heated Oxygen Sensor (HO2S) at the wiring connectors to prevent damage to the HO2S and wiring harness.

**NOTE:** The production muffler and tailpipe assembly is a 1-piece design. The service muffler and tailpipe assembly is serviced with 2 pieces. Refer to the Master Parts Catalog for part usage and interchangeability before installing a new exhaust system component.

The exhaust system:

- contains a 1-piece catalytic converter assembly on each side.
  - has a single or dual exhaust system.
  - has muffler brackets, with isolators at the muffler and the rear of the tailpipe, bolted to the body.
  - has exhaust dampers.
  - has 2 Heated Oxygen Sensor (HO2S).
  - has 2 Catalyst Monitor Sensor (CMS).
  - production muffler and tailpipe assembly is a one-piece design exhaust system.
-

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## Exhaust System

### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect the components of the exhaust system and related controls that may affect exhaust gas quality or loss of power.
3. Visually inspect for obvious signs of mechanical damage. Refer to the following chart.

### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• Exhaust pipe pinched or crushed</li> <li>• Damaged muffler</li> <li>• Broken or damaged exhaust hanger brackets</li> <li>• Damaged catalytic converter</li> <li>• Cracked exhaust manifold</li> <li>• Loose or damaged heat shields</li> </ul>

4. Verify that the exhaust system is installed correctly, with clamps correctly located and tightened to specification.
5. If the fault is not visually evident, determine the symptom. GO to Symptom Chart - Exhaust System or GO to Symptom Chart - NVH.

### Symptom Chart - Exhaust System

Symptom Chart - Exhaust System

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is

possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

#### ConditionPossible SourcesAction

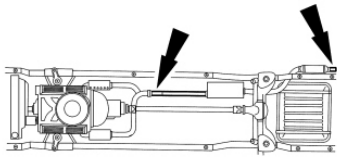
- Rattle, squeaks or buzz type noise - from the bottom of the vehicle
- Loose or damaged heat shield
- INSPECT the exhaust system for loose or missing heat shields or foreign material trapped between the heat shields and the exhaust system components. If any heat shields are loose, INSTALL worm gear clamp 7L5Z-5A231-AA and tighten to 7 Nm (62 lb-in). If the heat shields are missing, INSTALL new heat shields or exhaust system components as necessary. If a rattle, noise or buzz condition persists, INSTALL a new heat shield or component as necessary. TEST the system for normal operation after the repair.
- Loose or damaged exhaust isolators
- VERIFY that the exhaust isolators are correctly installed. INSPECT the exhaust isolators for wear or damage. INSTALL new isolators as necessary. TEST the system for normal operation after the repair.
- Damaged exhaust isolator hanger bracket
- INSPECT the exhaust system components for damage or broken hangers. INSTALL new components as necessary. CHECK for loose or damaged exhaust hanger brackets or fasteners. TIGHTEN the bolts to specification or INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Loose or damaged catalytic converter or muffler
- MOVE the exhaust system to simulate the bouncing action of the vehicle, checking for exhaust-to-body contact while moving the exhaust system. Using a rubber mallet, TAP on the exhaust components to duplicate the noise concern. Lightly TAP on the muffler, then the catalytic converter. DETERMINE if there are loose or broken baffles in the muffler or a loose or broken element in the catalytic converter. REPAIR or INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Exhaust grounded to chassis
- INSPECT for signs of exhaust components-to-body contact. If necessary, CARRY OUT the Exhaust System Alignment in this section.
- Drone or clunk type noise - from the bottom of the vehicle
- Loose or damaged exhaust isolators
- INSPECT the exhaust isolators for wear or damage. INSTALL new isolators as necessary. TEST the system for normal operation after the repair.
- Exhaust grounded to chassis
- INSPECT for signs of exhaust components-to-body contact. If necessary, CARRY OUT the Exhaust System Alignment in this section.

- Whistles, boom, hum or ticking type noise - noise tends to change as the engine warms. The noises are often accompanied by exhaust fumes
- Exhaust system leak
- INSPECT the entire exhaust system for leaks. CHECK for punctures, loose or damaged clamps/fasteners, gaskets, sensors or broken welds. EXAMINE the chassis for grayish-white or black exhaust soot, which indicates exhaust leakage at that point. To magnify a small leak, have an assistant hold a rag over the tailpipe outlet while listening for a leak. REPAIR or INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Catalytic converter
- MOVE the exhaust system to simulate the bouncing action of the vehicle, checking for exhaust-to-body contact while moving the exhaust system. Using a rubber mallet, TAP on the exhaust components to duplicate the noise concern. Lightly TAP on the muffler and the catalytic converter. DETERMINE if there are loose or broken baffles in the muffler, or a loose or broken element in the catalytic converter. REPAIR or INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Exhaust muffler/resonator drain hole enlarged due to corrosion
- CONFIRM the drain holes are the noise source. INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Hissing or rushing noise - high frequency sound. Vehicle performance is unaffected
- Exhaust system. Exhaust flow through pipes
- CHECK the exhaust system for leaks. Using a rubber mallet, TAP on the exhaust components to duplicate the noise concern. Lightly TAP on the muffler and the catalytic converter. DETERMINE if there are loose or broken baffles in the muffler, or a loose or broken element in the catalytic converter. REPAIR or INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Pinging noise - occurs when exhaust system is hot, engine turned off
- Catalytic converter/exhaust system
- Cool down pinging is a result of the exhaust system expanding and contracting during heating and cooling. This is a normal condition.
- Vibration - occurs at idle and at low speeds. Also accompanied by a clunk or buzz type noise
- Loose or damaged exhaust isolator
- INSPECT the exhaust isolators for wear or damage. INSTALL new isolators as necessary. TEST the system for normal operation after the repair.
- Loose or damaged exhaust isolator hanger brackets
- INSPECT the exhaust isolator hanger brackets for wear or damage. INSTALL or REPAIR as necessary. TEST the system for normal operation after the repair.

- Damper broken or out of position
- CHECK for the correct damper orientation in this section. RELOCATE to the correct position and tighten the nuts to specification. INSPECT for missing or damaged damper. INSTALL new components as necessary. TEST the system for normal operation after the repair.
- Exhaust system grounded to chassis
- CARRY OUT the Exhaust System Alignment in this section.
- Engine drumming noise - normally accompanied by vibration
- Damaged or misaligned exhaust system
- INSPECT the exhaust system for loose or damaged fasteners, Torca® clamps or isolators. CARRY OUT the Exhaust System Alignment in this section.
- Sputter type noise - noise worse when cold, lessens or disappears when the vehicle is at operating temperature
- Damaged or worn exhaust system
- INSPECT the exhaust system for leaks or damage. REPAIR as necessary. TEST the system for normal operation after the repair.
- Thumping noise - from the bottom of the vehicle, worse during acceleration
- Misaligned exhaust system
- CHECK the exhaust system to chassis clearance. CHECK the exhaust system isolators for damage. REPAIR as necessary. TEST the system for normal operation after the repair.
- Engine vibration - is felt with increases and decreases in engine rpm
- Strain on exhaust system isolators
- CARRY OUT the Exhaust System Alignment in this section. REPAIR as necessary. TEST the system for normal operation after the repair.
- Drumming noise - occurs inside the vehicle during idle or high idle, hot or cold. Very low-frequency drumming is very rpm dependent
- Exhaust system vibration excites the body resonances inducing interior noise
- GO to Pinpoint Test A .

## Pinpoint Test

## PINPOINT TEST A: DRUMMING NOISE

Test Step	Result / Action to Take
<b>A1 CHECK THE EXHAUST SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Increase the engine rpm until the noise is the loudest. Note the engine rpm.</li> <li>• Ignition OFF.</li> <li>• Add approximately 9 kg (20 lb) of weight to the exhaust system. First place the weight at the tail pipe and test. Repeat at the front pipe.</li> </ul>  <p>DF1768-A</p> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Increase the engine rpm and listen for the drumming noise. Note the engine rpm if the noise occurs.</li> <li>• Ignition OFF.</li> <li>• Remove the weight from the exhaust system.</li> <li>• <b>Is the noise/vibration reduced or eliminated, or does the noise/vibration occur at a different rpm?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Exhaust System Alignment</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> CONDUCT a diagnosis on other suspect systems. REFER to <u>Section 100-04</u> .</p>

## Exhaust System Alignment

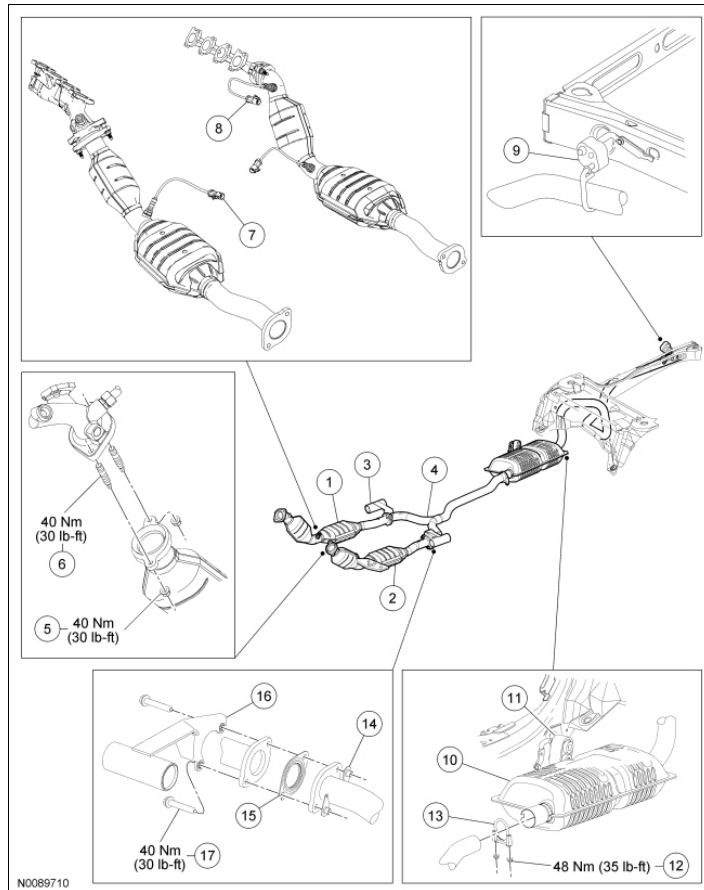
1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Loosen all fasteners joining the exhaust system components.
3. Beginning at the front of the vehicle, align the exhaust system to establish the maximum clearance. Make sure all fit pipes are pushed all the way into the preceding pipe and the notches are correctly lined up with the tabs.
4. Beginning at the front of the vehicle, tighten all fasteners and clamps to specification. For additional information, refer to Specifications in this section.
5. Start the engine and check the exhaust system for leaks.
6. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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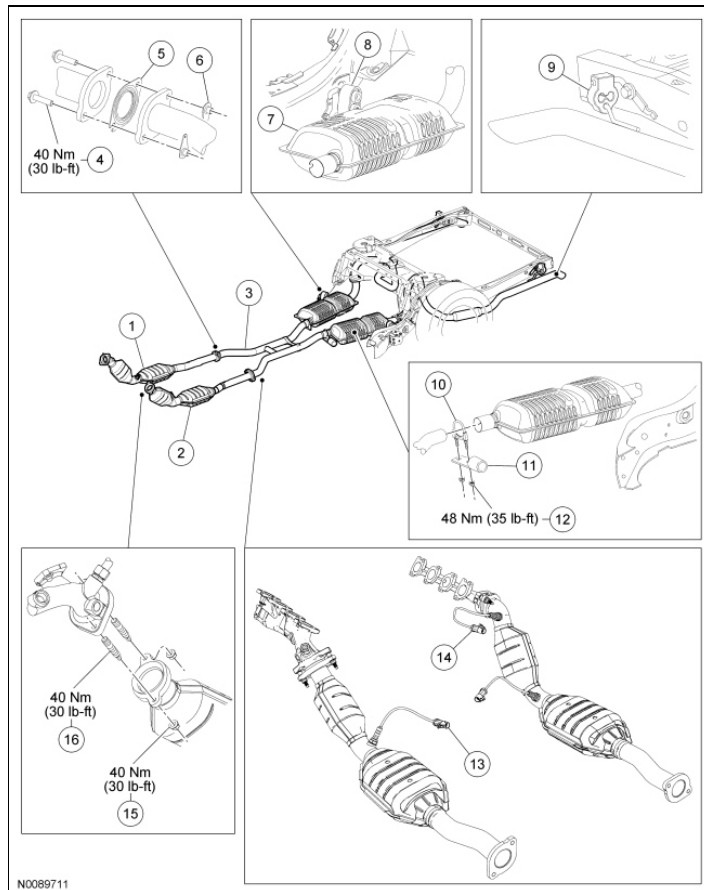
**Exhaust System - Exploded View****Single Exhaust**

Item	Part Number	Description
1	5E212	Catalytic converter, RH
2	5E212	Catalytic converter, LH
3	5F240	Damper - RH (except police vehicles)
4	5246	Exhaust inlet pipe
5	W520414	Catalytic converter-to-exhaust manifold nut (4 required)
6	W710732	Catalytic converter-to-exhaust manifold stud (4 required)
7	14A464	Catalyst Monitor Sensor (CMS) electrical connector (2 required)
8	14A464	Heated Oxygen Sensor (HO2S) electrical connector
9	5256	Tailpipe isolator and bracket
10	5C258	Muffler
11	5A262	Muffler isolator and bracket
12	N802771	Clamp nut (2 required)
13	N802771	Clamp



14	391188	Flagnut (4 required)
15	5E241	Gasket
16	5F295	Damper - LH (except police vehicles)
17	56143	Catalytic converter-to-exhaust inlet pipe bolt (4 required)

## Dual Exhaust



Item	Part Number	Description
1	5E212	Catalytic converter, RH
2	5E212	Catalytic converter, LH
3	5246	Exhaust inlet pipe
4	56143	Catalytic converter-to-exhaust inlet pipe bolt (4 required)
5	5F263	Gasket
6	391188	Flagnut (4 required)
7	5C258	Muffler (2 required)
8	5A262	Muffler isolator and bracket (2 required)
9	5256	Tailpipe isolator and bracket (2 required)
10	N802771	Clamp (2 required)
11	5F240	Damper - RH/LH

12	N802771	Clamp nut (4 required)
13	14A464	Catalyst Monitor Sensor (CMS) electrical connector (2 required)
14	14A464	Heated Oxygen Sensor (HO2S) electrical connector
15	W520414	Catalytic converter-to-exhaust manifold nut (4 required)
16	W701732	Catalytic converter-to-exhaust manifold stud (4 required)

1. For additional information, refer to the procedures in this section.
-

## Muffler and Tailpipe

### Removal

**NOTICE:** Do not use oil or grease-based lubricants on the isolators. They may cause deterioration of the rubber.

**NOTICE:** Oil or grease-based lubricants on isolators may cause the exhaust hanger isolators to separate from the exhaust hanger bracket during vehicle operation.

**NOTE:** The production muffler and tailpipe assembly is a one-piece design. The service muffler and tailpipe is serviced with 2 pieces.

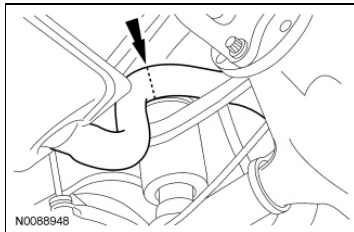
1. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

If equipped, turn the air suspension switch OFF.

2. **NOTE:** Single exhaust shown, dual exhaust similar.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

3. Cut the tailpipe as indicated in the illustration.



4. Remove the 2 nuts, the exhaust damper (if equipped) and the exhaust inlet pipe-to-muffler clamp.
  - Discard the nuts.
  - To install, tighten the new nuts to 48 Nm (35 lb-ft).
5. Detach the muffler from the exhaust isolators.
6. Detach the tailpipe from the exhaust isolator.

### Installation

1. **NOTE:** Check the isolator for wear or damage. Install a new isolator as necessary.

Position the tailpipe and attach the isolator.

2. **NOTE:** Check the isolator for wear or damage. Install a new isolator as necessary.

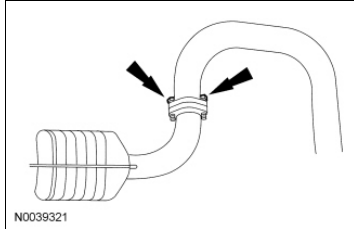
Position the muffler and attach the isolator.

3. **NOTE:** Install new exhaust fasteners. Do not tighten the fasteners until all components are assembled.

**NOTE:** Alternately tighten the fasteners to specifications, to draw flanges together evenly.

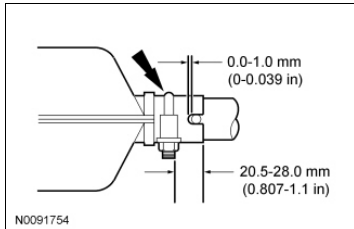
Connect the muffler and tailpipe and install new fasteners.

- Tighten to 33 Nm (24 lb-ft).



4. Connect the exhaust inlet pipe and muffler.

- Install the clamp, the exhaust damper (if equipped) and the 2 nuts.
  - ◆ Tighten the new nuts to 48 Nm (35 lb-ft).



5. If equipped, turn the air suspension switch on.
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## Muffler and Tailpipe - Fire Suppression System

### Removal

**NOTICE:** Do not use oil or grease-based lubricants on isolators. They may cause deterioration of the rubber.

**NOTICE:** Oil or grease lubricants on the isolators may cause the exhaust hanger isolators to separate from the exhaust hanger bracket during vehicle operation.

1.  **WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

**NOTE:** Single exhaust shown, dual similar.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Remove the rear suspension lateral arms. For additional information, refer to Section 204-02 .
3. Remove the rear coil springs. For additional information, refer to Section 204-02 .
4. Remove the 2 nuts, the exhaust damper (if equipped) and the exhaust inlet pipe-to-muffler clamp.
  - Discard the nuts.
5. **NOTE:** Carefully turn the muffler and tail pipe assembly counterclockwise around the rear axle to remove.

Detach the 2 isolators and remove the muffler and tail pipe.

### Installation

1. **NOTE:** Check the isolator for wear or damage. Install a new isolator as necessary.

Position the tail pipe and attach the isolator.

2. **NOTE:** Check the isolator for wear or damage. Install a new isolator as necessary.

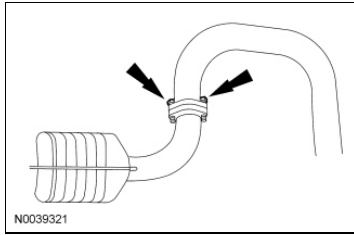
Position the muffler and attach the isolator.

3. **NOTE:** Install new exhaust fasteners. Do not tighten the fasteners until all components are assembled.

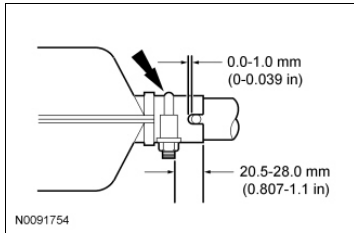
**NOTE:** Alternately tighten the fasteners to specifications. Draw flanges together evenly.

Connect the muffler and tail pipe and install new fasteners.

- Tighten nuts to 33 Nm (24 lb-ft).



4. Connect the exhaust inlet pipe and muffler.
  - Install the clamp, the exhaust damper (if equipped) and the 2 nuts.
  - ◆ Tighten to 48 Nm (35 lb-ft).



5. Install the rear coil springs. For additional information, refer to [Section 204-02](#) .
6. Install the rear suspension lateral arms. For addition information, refer to [Section 204-02](#) .
7. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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## Catalytic Converter

### Removal and Installation

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A**.

2. **⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

If equipped, turn the air suspension switch OFF.

3. For RH catalytic converter removal, disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
4. Disconnect the Catalyst Monitor Sensor (CMS) electrical connector.
5. **NOTE:** To correctly seat the converter, alternately tighten the catalytic converter-to-exhaust manifold nuts to specification.

Remove and discard the 2 catalytic converter-to-exhaust manifold nuts.

- To install, alternately tighten the new nuts to 40 Nm (30 lb-ft).

6. **NOTE:** Alternate tightening the catalytic converter-to-exhaust inlet pipe bolts to specifications to draw the flanges together evenly.

Remove the 2 catalytic converter-to-inlet pipe bolts, the 2 flagnuts, the damper (if equipped) and the catalytic converter.

- Discard the bolts, the flagnuts and the gaskets.
- To install, alternately tighten the new bolts to 40 Nm (30 lb-ft).

7. **NOTICE:** Prior to installation, inspect the HO2S and the CMS wiring harness for damage.

**NOTE:** Clean the mating surfaces of the exhaust manifold, the outlet pipe and the catalytic converter.

**NOTE:** Always install new exhaust system fasteners and gaskets. Do not tighten the fasteners until all components are assembled. Make sure to tighten all fasteners beginning at the front of the vehicle.

To install, reverse the removal procedure.

8. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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## SECTION 310-00: Fuel System - General Information

2010 Crown Victoria, Grand Marquis  
Workshop Manual

## SPECIFICATIONS

Procedure revision date: 08/19/2009

## Material

Item	Specification	Fill Capacity
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	-

## General Specifications

Item	Specification
Fuel tank capacity	71.9L (19 gal)
<b>Fuel Pressure</b>	
Hot restart	448-482 kPa (65-70 psi)
Key ON Engine OFF (KOEO)	140-415 kPa (20-60 psi)
Key ON Engine Running (KOER)	170-280 kPa (25-40 psi)

## Fuel System

The fuel system consists of the:

- fuel filter.
- fuel injectors.
- Fuel Pump (FP) module.
- fuel rail.
- fuel rail pressure and temperature sensor.
- fuel tank.
- fuel tank filler cap.
- fuel tank filler pipe.
- Fuel Tank Pressure (FTP) sensor.
- fuel tubes (liquid and vapor).
- Inertia Fuel Shutoff (IFS) switch.


The vehicle:

- is equipped with a sequential Multi-Port Fuel Injection (MFI) system.
  - uses separately controlled fuel injectors mounted to the intake manifold for each cylinder.
  - has a FP module that supplies fuel under pressure to the fuel rail.
  - has fuel tubes (liquid and vapor) mounted on the underside of the vehicle in a bundle.
  - has a serviceable fuel level sender mounted on the FP module.
  - has a FTP sensor (part of the fuel vapor tube assembly).
  - uses separately controlled fuel injectors for each cylinder. The fuel injectors are mounted to the intake manifold.
  - fuel injectors are supplied with pressurized fuel from the FP module to the fuel rail.
  - has a fuel rail which is equipped with a fuel rail pressure and temperature sensor.
  - fuel injection rail pressure is controlled by the electronic FP module which is enabled by the PCM.
  - has a one-fourth turn vented type fuel tank filler cap.
  - has a fuel tank filler pipe assembly, which cannot be modified in any way, that also contains a restrictor plate to permit only unleaded fuel to be pumped into the fuel tank.
  - has a fuel tank filler pipe check valve that prevents spitback during refueling.
  - has an IFS switch located in the passenger side footwell that shuts off fuel in the event of a collision.
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## Fuel System

### Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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### Principles of Operation

**NOTE:** The following procedure diagnoses a slow to fill concern only. For all other concerns refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

The fuel tank filler pipe assembly is used to refuel the vehicle. The fuel tank filler pipe check valve prevents spitback of fuel during and after refueling. The fuel tank stores the fuel. The fuel tank contains a Fuel Pump (FP) module. The FP module consists of a fuel level sender and a FP . The fuel level sender sends a signal to the fuel gauge, informing the driver of how much fuel is in the fuel tank. The FP module provides fuel to the fuel tubes which supply the fuel rail.

During refueling, the fuel tank vents to the atmosphere through the vent and filler pipes, on vehicles without On-Board Refueling Vapor Recovery (ORVR) systems. In vehicles equipped with ORVR , the fuel tank and filler pipe are designed so that when the vehicle is being refueled, fuel vapors in the fuel tank travel to the Evaporative Emission (EVAP) canister, which absorbs the fuel vapors and vents the pressure from the fuel tank during refueling.

### Inspection and Verification

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern by refueling the vehicle and observe the fuel fill rate.

2. Inspect to determine if any of the following mechanical concerns apply.

### Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• Bent, kinked or damaged fuel tank filler pipe</li> <li>• Bent, kinked or damaged fuel tank filler pipe fresh air hose or recirculation tube (if equipped)</li> <li>• Incorrect routing of the fuel tank filler pipe</li> <li>• Incorrect routing of the fuel tank filler pipe fresh air hose or recirculation tube (if equipped)</li> <li>• Incorrect position of fuel tank filler pipe clamps</li> <li>• Incorrect position of fuel tank filler pipe fresh air hose or recirculation tube clamps (if equipped)</li> <li>• Fuel tank mounted vapor tubes bent or damaged</li> <li>• Evaporative Emission (EVAP) system tubes or hoses bent or damaged</li> <li>• Accident damage to the fuel tank</li> <li>• Accident damage to the vehicle effecting the fuel tank filler pipe-to-body connection</li> <li>• Unauthorized modifications and/or alterations to the vehicle</li> <li>• Fuel tank filler pipe fresh air hose or recirculation tube plugged (dirt, spider webbing)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- verify the ignition key is in the ON position.
- verify the scan tool operation with a known good vehicle.
- refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the continuous DTCs and carry out the self test diagnostics for the Evaporative Emission (EVAP) system.

9. If the DTCs retrieved are related to the concern, go to Evaporative Emission (EVAP) System DTC Chart. For PCM related DTCs, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual. For all other DTCs, refer to Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Chart

### Evaporative Emission (EVAP) System DTC Chart

DTC	Description	Action
P0446	Evaporative Emission System Vent Control Circuit	<u>GO to Pinpoint Test A</u> .
P0451	Evaporative Emission System Pressure Sensor/Switch Range/Performance	<u>GO to Pinpoint Test A</u> .
P0452	Evaporative Emission System Pressure Sensor/Switch Low	<u>GO to Pinpoint Test A</u> .
P0453	Evaporative Emission System Pressure Sensor/Switch High	<u>GO to Pinpoint Test A</u> .
P0454	Evaporative Emission System Pressure Sensor/Switch Intermittent	<u>GO to Pinpoint Test A</u> .
P1450	Unable to Bleed up Fuel Tank Vacuum	<u>GO to Pinpoint Test A</u> .
P1451	Evaporative Emission System Vent Control Circuit	<u>GO to Pinpoint Test A</u> .
P260F	Emission System Monitoring Processor Performance	<u>GO to Pinpoint Test A</u> .

## Symptom Chart

Symptom Chart

### Pinpoint Test

#### Pinpoint Test A: Slow to Fill

##### Normal Operation

Under normal operation, fuel should flow at a steady rate through the fuel tank filler pipe into the fuel tank. As fuel enters the fuel tank, air is vented through the filler pipe or the On-Board Refueling Vapor Recovery (ORVR) system.

##### **This pinpoint test is intended to diagnose the following:**

- Fuel tank filler pipe fresh air hose or recirculation tube, if equipped
- Fuel tank filler pipe
- Evaporative Emission (EVAP) system
- Fuel tank filler pipe check valve (part of the fuel tank filler pipe assembly)
- Fuel Limit Vent Valve (FLVV) (mounted on the fuel tank)

## PINPOINT TEST A: SLOW TO FILL

Test Step	Result / Action to Take
<b>A1 CARRY OUT INSPECTION AND VERIFICATION</b>	
<ul style="list-style-type: none"> <li>Carry out inspection and verification.</li> <li><b>Was the cause of the concern found?</b></li> </ul>	<p><b>Yes</b> REPAIR or INSTALL new components to correct the concern.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE SYSTEM FOR ANY EVAP DTCs</b>	
<ul style="list-style-type: none"> <li>Connect the scan tool.</li> <li>Check the system for any of the following EVAP DTCs: P0446, P0451, P0452, P0453, P0454, P1450, P1451 and P260F.</li> <li><b>Are any of these DTCs present?</b></li> </ul>	<p><b>Yes</b> REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual to diagnosis the EVAP system.</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 MONITOR THE FTP WHILE FILLING THE FUEL TANK</b>	
<ul style="list-style-type: none"> <li>Monitor the Fuel Tank Pressure (FTP) reference value while filling the fuel tank. Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</li> <li><b>Is FTP within specification?</b></li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> GO to <u>A4</u> .</p>
<b>A4 MONITOR THE FTP WHILE FILLING THE FUEL TANK WITH THE EVAP SYSTEM DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>Disconnect the fuel tank-to- EVAP canister quick connect coupling at the EVAP canister. Refer to <u>Quick Connect Coupling</u> in this section.</li> <li>Monitor the FTP reference value while filling the fuel tank. Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.</li> <li><b>Is FTP within specification?</b></li> </ul>	<p><b>Yes</b> INSPECT the EVAP system for blockage or restrictions. REPAIR the blockage or restriction. If the blockage or restriction cannot be repaired, INSTALL new EVAP system components.</p> <p><b>No</b> GO to <u>A5</u> .</p>
<b>A5 CHECK THE FUEL TANK FILLER PIPE ASSEMBLY FOR BLOCKAGE OR RESTRICTION</b>	
<ul style="list-style-type: none"> <li>Remove the fuel tank filler pipe assembly. Refer to <u>Section 310-01</u> .</li> <li>Inspect the fuel tank filler pipe and fuel tank filler pipe fresh air hose or recirculation tube (if equipped) for a blockage or restriction.</li> </ul>	<p><b>Yes</b> If possible, REPAIR the blockage or restriction. If the blockage or restriction cannot be repaired, INSTALL a new fuel tank filler pipe. REFER to <u>Section 310-01</u> .</p> <p><b>No</b> GO to <u>A6</u> .</p>

<ul style="list-style-type: none"> <li>• <b>Is the fuel tank filler pipe or fuel tank filler pipe fresh air hose or recirculation tube (if equipped) blocked or restricted?</b></li> </ul>	
<p><b>A6 CHECK TO MAKE SURE THAT THE FLVV IS FUNCTIONING CORRECTLY</b></p>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> The Fuel Limit Vent Valve (FLVV), is mounted externally on the fuel tank.</li> <li>• Remove the FLVV . Refer to <u>Section 303-13</u> .</li> <li>• Invert the FLVV . Listen for a clicking noise in both directions.</li> <li>• <b>Was a clicking noise witnessed?</b></li> </ul>	<p><b>Yes</b> FLVV is OK. RETEST the system for normal operation.</p> <p><b>No</b> INSTALL a new FLVV . REFER to <u>Section 303-13</u> .</p>



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**Fuel System Pressure Release**

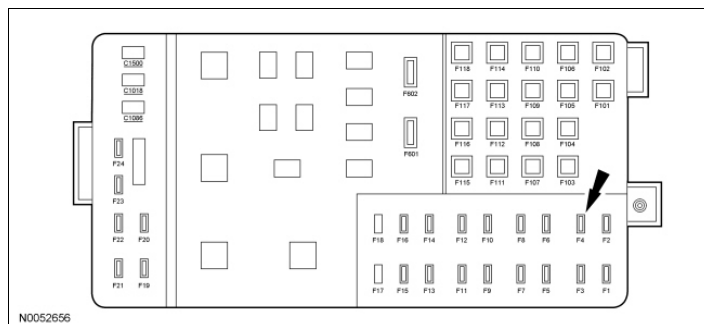
**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

1. **NOTE:** The Fuel Pump (FP) module fuse is located in the Battery Junction Box (BJB), location F4.

Remove the FP module fuse.




2. Start the engine and allow it to idle until it stalls.
3. After the engine stalls, crank the engine for approximately 5 seconds to make sure the fuel system pressure has been released.
4. Turn the ignition switch to the OFF position.
5. When fuel system service is complete, install the FP module fuse.
6. **NOTE:** It may take more than one key cycle to pressurize the fuel system.  
  
Cycle the ignition key and wait 3 seconds to pressurize the fuel system.
7. **NOTE:** Carry out a Key ON Engine OFF (KOEO) visual inspection for fuel leaks prior to starting the engine.

Start the vehicle and check the fuel system for leaks.



## Fuel System Pressure Test

Special Tool(s)

	Fuel Pressure Test Kit 310-D009 (D95L-7211A)
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**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

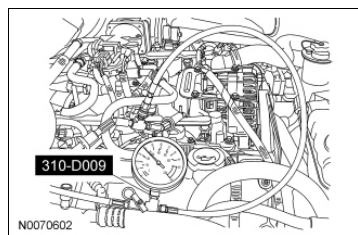
**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

1. Release the fuel system pressure. For additional information, refer to Fuel System Pressure Release in this section.
2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .
3. Disconnect the fuel tube-to-fuel rail spring lock coupling. For additional information, refer to Spring Lock Couplings in this section.
4. Install the Fuel Pressure Test Kit inline between the fuel tube and the fuel rail.



5. **NOTE:** The Fuel Pump (FP) module fuse was removed previously in the Fuel System Pressure Release.

Install the FP module fuse.

6. Connect the battery ground cable. For additional information, refer to Section 414-01 .

7. **NOTE:** Carry out a Key ON Engine OFF (KOEO) visual inspection for fuel leaks prior to the Fuel System Pressure Test.

**NOTE:** After completion of the Fuel System Pressure Test, open the drain valve on the Fuel Pressure Test Kit and release any residual fuel into a suitable container prior to removing.

Test the fuel system pressure to make sure it is within the specified range. For additional information, refer to Specifications in this section.

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**Fuel Tank Draining**

Special Tool(s)

	Fuel Storage Tanker 164-R3202 or equivalent
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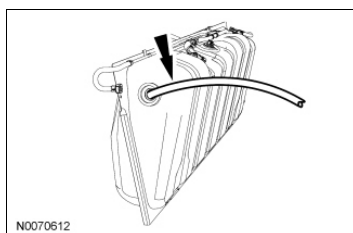
**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

1. Remove the fuel tank filler pipe. For additional information, refer to [Section 310-01](#) .
2. Using the Fuel Storage Tanker and a suitable fuel drain tube, extract the remaining fuel from the fuel tank.





**Spring Lock Couplings**

Special Tool(s)

	Disconnect Tool, Spring Lock Coupling (3/8 Inch, Yellow) 310-D004 (D87L-9280-A) or equivalent
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Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Disconnect**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

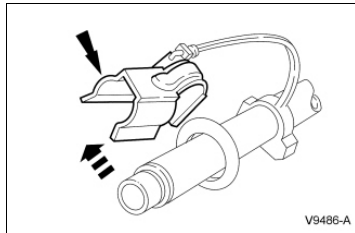
**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

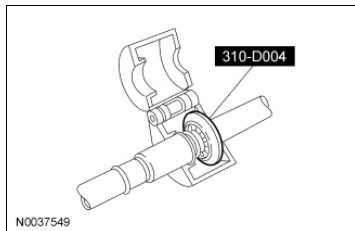
**NOTICE:** When reusing liquid or vapor tube connectors, make sure to use compressed air to remove any foreign material from the connector retainer clip area before separating from the tube or damage to the tube or connector retaining clip can occur. Apply clean engine oil to the end of the tube before inserting the tube into the connector.

**NOTICE:** Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components or component damage can occur. Always install blanking plugs to any open orifices or tubes.

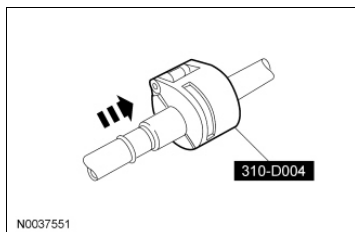
1. If disconnecting a liquid fuel tube spring lock coupling, release the fuel system pressure. For additional information, refer to [Fuel System Pressure Release](#) in this section.
2. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
3. Remove the fuel tube safety clip.



4. Install the Spring Lock Coupling Disconnect Tool onto the spring lock coupling.



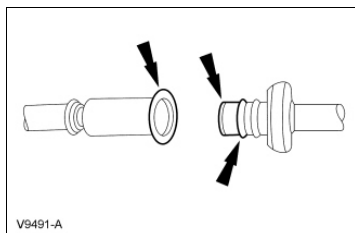
5. Close and push the Spring Lock Coupling Disconnect Tool into the open side of the cage.



6. Disconnect the spring lock coupling from the tube fitting.

## Connect

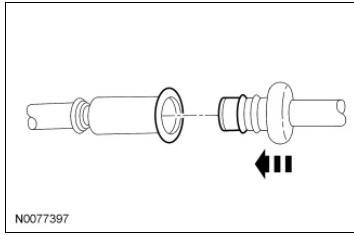
1. Inspect and clean the tube fitting, spring lock coupling and the O-ring seals.
  - Lubricate the O-ring seals with clean engine oil.



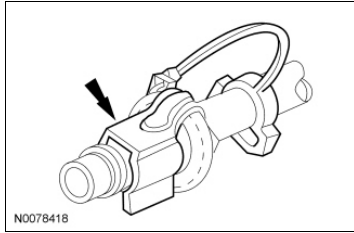
2. **NOTE:** Make sure the spring lock coupling is completely seated and locked in place by pulling on the coupling.



Connect the spring lock coupling onto the tube fitting.



3. Install the safety clip.



4. Connect the battery ground cable. For additional information, refer to [Section 414-01](#) .

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**Quick Connect Coupling**

## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

**Disconnect - Type I**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

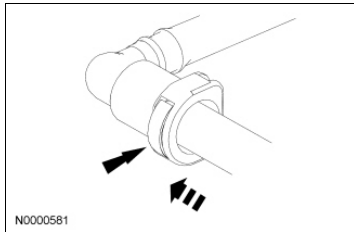
**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** When reusing liquid or vapor tube connectors, make sure to use compressed air to remove any foreign material from the connector retaining clip area before separating from the tube or damage to the tube or connector retaining clip can occur. Apply clean engine oil to the end of the tube before inserting the tube into the connector.

**NOTICE:** Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components or component damage can occur. Always plug or cap any open orifice or tube.

**NOTICE:** Do not use any tools. The use of tools may cause a deformity in the clip components which may cause fuel leaks.

1. If disconnecting a liquid fuel tube quick connect coupling, release the fuel system pressure. For additional information, refer to [Fuel System Pressure Release](#) in this section.
2. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
3. Disconnect the quick connect coupling from the tube.
  - Press the quick connect coupling release button and separate the quick connect coupling from the tube.

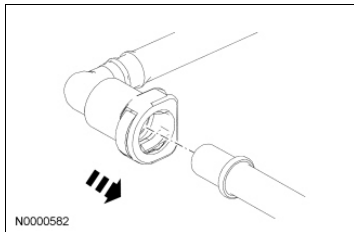


### Connect - Type I

1. **NOTE:** Apply clean engine oil to O-ring seals.

**NOTE:** Make sure the tube clicks into place when installing the quick connect coupling onto the tube. To make sure that the tube is fully seated, pull on the coupling.

Connect the quick connect coupling onto the tube until fully seated.



2. Connect the battery ground cable. For additional information, refer to [Section 414-01](#) .

### Disconnect - Type II

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

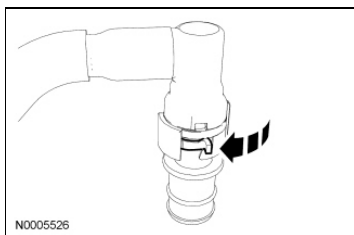
**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** When reusing liquid or vapor tube connectors, make sure to use compressed air to remove any foreign material from the connector retaining clip area before separating from the tube or damage to the tube or connector retaining clip can occur. Apply clean engine oil to the end of the tube before inserting the tube into the connector.

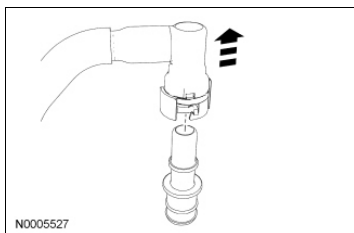
**NOTICE:** Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components or component damage can occur. Always plug or cap any open orifice or tube.

**NOTICE:** Do not use any tools. The use of tools may cause a deformity in the clip components which may cause fuel leaks.

1. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
2. Release the lock tab on the quick connect coupling.

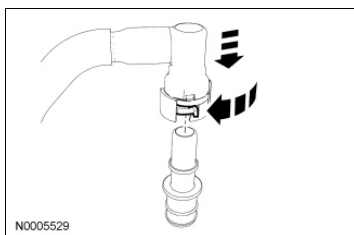


3. Disconnect the quick connect coupling from the fitting.



### Connect - Type II

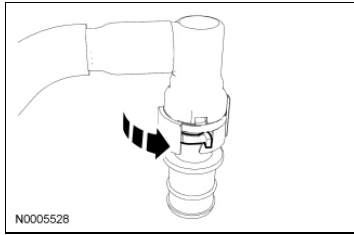
1. Release the lock tab and install the quick connect coupling onto the fitting.



2. **NOTE:** Apply clean engine oil to O-ring seals.

**NOTE:** Make sure the fitting clicks into place when installing the quick connect coupling onto the fitting. To make sure that the fitting is fully seated, pull on the coupling.

Place the lock tab into the LATCHED position.



3. Connect the battery ground cable. For additional information, refer to Section 414-01 .
-

## Material

Item	Specification	Fill Capacity
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A	-

## General Specifications

Item	Specification
Fuel tank capacity	71.9L (19 gal)

## Torque Specifications

Description	Nm	lb-ft	lb-in
Fuel filter bracket clamp	5	-	44
Fuel Pump (FP) module bolts	10	-	89
Fuel tank filler pipe bracket bolt	5	-	44
Fuel tank filler pipe flange bolts	5	-	44
Fuel tank filler pipe seal bolts	5	-	44
Fuel tank strap nuts	35	26	-
Fuel tube bundle bolts	12	-	106
Inertia Fuel Shutoff (IFS) switch bolts	12	-	106



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## Fuel Tank and Lines

The fuel tank and lines consist of the:

- fuel tank.
- fuel tank filler pipe.
- fuel tank filler cap.
- Fuel Pump (FP) module.
- fuel tubes (liquid and vapor).
- fuel filter.
- Fuel Tank Pressure (FTP) sensor.
- Inertia Fuel Shutoff (IFS) switch.

The vehicle:

- has a FP module that supplies fuel under pressure to the fuel rail.
- has an externally mounted fuel filter providing filtration to protect the fuel injectors.
- has fuel tubes (liquid and vapor) mounted on the underside of the vehicle in a bundle.
- has a FTP sensor (part of the fuel vapor tube assembly) that monitors FTP during engine operation and continuously transmits an input signal to the PCM.
- fuel injection rail pressure is controlled by the electronic FP module which is enabled by the PCM.
- has a one-fourth turn vented-type fuel tank filler cap.
- has a fuel tank filler pipe assembly, which cannot be modified in any way and is serviced only by installation of a new fuel tank filler pipe assembly.
- has an IFS switch located in the luggage compartment on the left rear deck lid bracket.
- fuel tank filler pipe contains a restrictor plate to permit only unleaded fuel to be pumped into the fuel tank.
- fuel tank filler pipe contains a spark arrestor for safety precautions.
- The FP module contains:
  - ◆ an electric FP which provides pressurized fuel to the fuel injectors.
  - ◆ a fuel level sensor.
  - ◆ an inlet filter (sock type).
  - ◆ a check valve which maintains system pressure after the pump is shut off.
  - ◆ a pressure relief valve for overpressure protection in the event of restricted flow.

The FP module is controlled by the PCM which energizes the FP module relay. Electrical power to the FP module is provided through the IFS switch located in the trunk on the left rear decklid bracket.

The IFS switch is used to de-energize the fuel delivery secondary circuit in the event of a collision. The IFS switch is a safety device that should only be reset after a thorough inspection of the vehicle following a collision.

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## **Fuel Tank and Lines**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

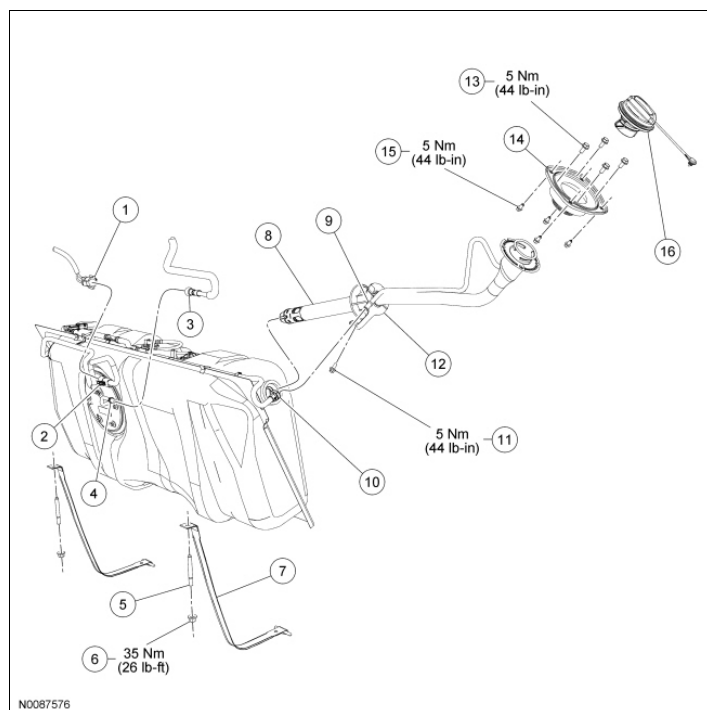
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# SECTION 310-01: Fuel Tank and Lines REMOVAL AND INSTALLATION

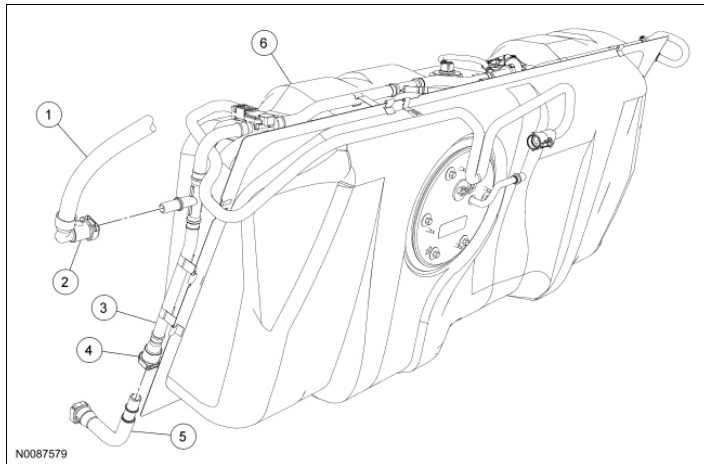
2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 02/24/2011

## Fuel Tank and Filler Pipe - Exploded View

### Fuel Tank and Filler Pipe



Item	Part Number	Description
1	14A464	Fuel Pump (FP) module electrical connector
2	-	FP module electrical connector retainer clip (part of 9H307)
3	-	Fuel tube-to- FP module spring lock coupling (part of 9J279)
4	9H307	FP module
5	N808978	Fuel tank strap stud (2 required)
6	N800627	Fuel tank strap nut (2 required)
7	9055	Fuel tank strap (2 required)
8	9034	Fuel tank filler pipe
9	-	Fuel tank filler pipe recirculation tube (part of 9034)
10	-	Fuel vapor tube assembly-to-fuel tank filler pipe recirculation tube quick connect coupling (part of 9C047)
11	W505252	Fuel tank filler pipe bracket bolt
12	-	Fuel tank filler pipe bracket (part of 9034)
13	N805402	Fuel tank filler pipe flange bolt (4 required)
14	9A125	Fuel tank filler pipe seal
15	N910157	Fuel tank filler pipe seal bolt (4 required)
16	9030	Fuel tank filler cap

**Fuel Tubes**

Item	Part Number	Description
1	9J279	Fuel vapor tube
2	-	Fuel vapor tube-to-fuel vapor tube assembly quick connect coupling (part of 9J279)
3	9C047	Fuel vapor tube assembly
4	-	Fuel vapor tube assembly-to-fuel vapor tube quick connect coupling (part of 9C047)
5	9K313	Fuel vapor tube
6	9002	Fuel tank

1. For additional information, refer to the procedures in this section.

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## Fuel Tank

### Removal and Installation

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

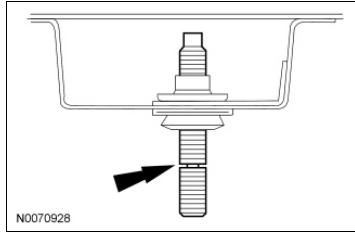
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

Release the fuel system pressure. For additional information, refer to Section 310-00 .

2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .
3. Drain the fuel tank. For additional information, refer to Section 310-00 .
4. Disconnect the Fuel Pump (FP) module electrical connector and release the retainer clip.
5. Disconnect the fuel tube-to- FP module spring lock coupling. For additional information, refer to Section 310-00 .
6. Disconnect the fuel vapor tube assembly-to-fuel vapor tube quick connect coupling. For additional information, refer to Section 310-00 .
7. Disconnect the fuel vapor tube-to-fuel vapor tube assembly quick connect coupling. For additional information, refer to Section 310-00 .

8. Completely lower and remove the fuel tank.
9. **NOTE:** The fuel tank strap studs are manufactured as a break-off style. After installing the new fuel tank strap studs and fuel tank installation is completed, break-off the excess length at the recess in the studs.

Remove and discard the fuel tank strap studs.



10. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

- Carry out the Evaporative Emission System Leak Test. For additional information, refer to Section 303-13 .

**Fuel Tank Filler Pipe**

## Special Tool(s)

	Fuel Storage Tanker 164-R3202 or equivalent
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## Material

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada) XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)	WSS-M2C945-A

**Removal and Installation**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B. Failure to follow the instructions may

**result in serious personal injury.**

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .
3. Carefully turn the fuel tank filler cap counterclockwise approximately one-fourth turn until the thread disengages and position aside.
4. **NOTE:** The fuel tank filler pipe has an internally mounted spark arrestor that will not allow a drain tube to enter the fuel tank.

Insert the tube from the Fuel Storage Tanker into the fuel tank filler pipe as far as possible and drain any residual fuel that may remain in the pipe.

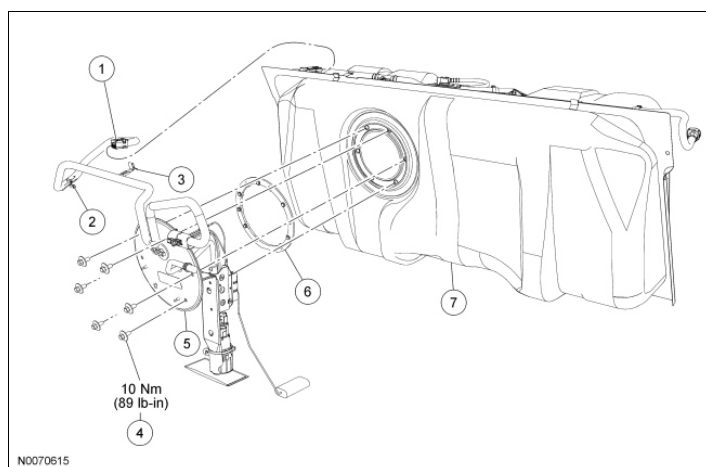
5. Remove the 4 fuel tank filler pipe flange bolts.
  - To install, tighten to 5 Nm (44 lb-in).
6. Remove the 4 fuel tank filler pipe seal bolts.
  - To install, tighten to 5 Nm (44 lb-in).
7. Disconnect the fuel vapor tube assembly-to-fuel tank filler pipe recirculation tube quick connect coupling. For additional information, refer to Section 310-00 .
8. Remove the fuel tank filler pipe bracket bolt.
  - To install, tighten to 5 Nm (44 lb-in).
9. Remove the fuel tank filler pipe assembly.
  - Rotate the fuel tank filler pipe counterclockwise one-half turn and remove it from the fuel tank.
10. To install, reverse the removal procedure.
  - Apply clean engine oil to the fuel tank filler pipe and grommet prior to installation.
11. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Fuel Pump Module**

Item	Part Number	Description
1	14A464	Fuel Pump (FP) module harness-to-Fuel Tank Pressure (FTP) sensor electrical connector
2	14A163	FP module wiring harness retainer
3	14A163	FP module wiring harness retainer
4	N602725	FP module bolt (6 required)
5	9H307	FP module
6	9C379	FP module seal
7	9002	Fuel tank

**Removal and Installation**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

Remove the fuel tank. For additional information, refer to Fuel Tank in this section.

2. Disconnect the Fuel Pump (FP) module harness-to-Fuel Tank Pressure (FTP) sensor electrical connector
3. Release the 2 FP module wiring harness retainers.
4. Clean the FP module mounting flange and immediate surrounding area of any dirt or foreign material.
5. **NOTICE: The Fuel Pump (FP) module must be handled carefully to avoid damage to the float arm and the filter.**

Remove the 6 bolts and the FP module.

- To install, tighten to 10 Nm (89 lb-in).

6. Remove and discard the FP module seal.
7. **NOTE:** Inspect the surfaces of the FP module flange and fuel tank seal contact surfaces. Do not polish or adjust the seal contact area of the FP module flange or fuel tank. Install a new FP module or fuel tank if the seal contact area is bent, scratched or corroded.

**NOTE:** Install a new FP module seal.

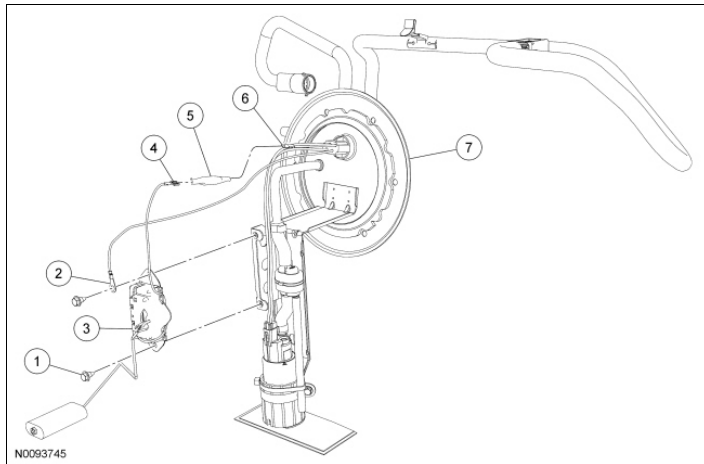
To install, reverse the removal procedure.

8. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Fuel Level Sender**

Item	Part Number	Description
1	N811388	Fuel level sender screw (2 required)
2	-	Fuel level sender ground wire eyelet (part of 9H307)
3	9A299	Fuel level sender
4	-	Fuel level sender electrical connector (part of 9A299)
5	-	Heat shrink tube
6	-	Fuel level sender electrical connector (part of 9H307)
7	9H307	Fuel Pump (FP) module

**Removal and Installation**

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.


**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

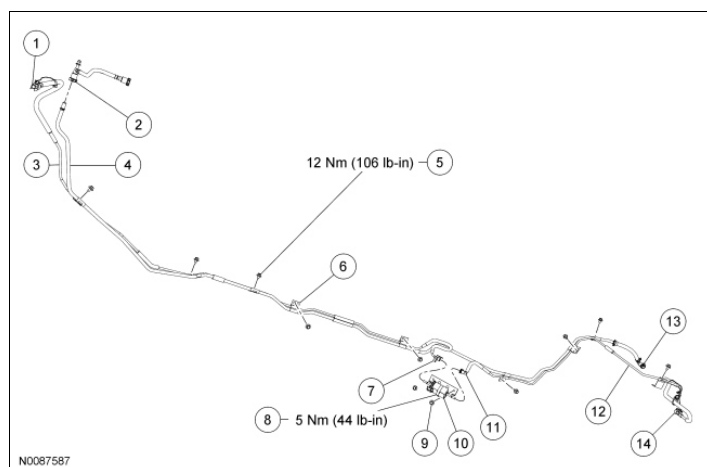
**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

1. Remove the Fuel Pump (FP) module. For additional information, refer to [Fuel Pump Module](#) in this section.

2. Remove the heat shrink tubing covering the fuel level sender electrical connector.
3. Disconnect the fuel level sender electrical connector.
4. Remove the screws, the ground wire eyelet and remove the fuel level sender from the FP module.
5. To install, reverse the removal procedure.
6.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

---

**Fuel Lines and Fuel Filter - Exploded View**

Item	Part Number	Description
1	-	Fuel tube-to-fuel rail spring lock coupling (part of 9G271)
2	-	Fuel vapor test port tube-to-fuel vapor tube quick connect coupling (part of 9J279)
3	9J279	Fuel tube
4	9J279	Fuel vapor tube
5	W709747	Fuel tube bundle bolt (9 required)
6	-	Fuel tube bundle retainer (part of 9J279) (9 required)
7	-	Fuel tube-to-fuel filter outlet spring lock coupling (part of 9J279)
8	9180	Fuel filter bracket and clamp assembly
9	W709747	Fuel filter bracket bolt (2 required)
10	9155	Fuel filter
11	-	Fuel tube-to-fuel filter inlet spring lock coupling (part of 9J279)
12	9J279	Fuel tube
13	-	Fuel vapor tube-to-fuel vapor tube assembly quick connect coupling (part of 9J279)
14	-	Fuel tube-to-Fuel Pump (FP) module spring lock coupling (part of 9J279)

1. For additional information, refer to the procedures in this section.





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## Fuel Lines

### Removal and Installation

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

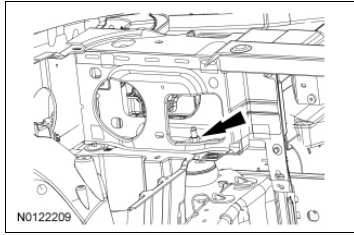
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

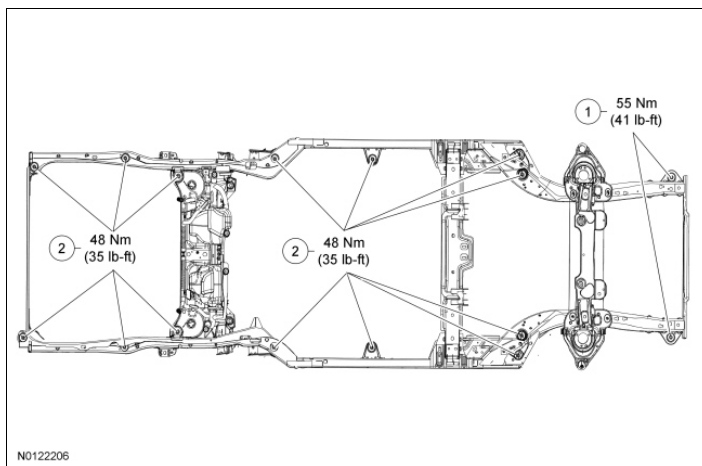
2. Release the fuel system pressure. For additional information, refer to [Section 310-00](#) .
3. Disconnect the battery ground cable. For additional information, refer to [Section 414-01](#) .
4. **NOTE:** Some residual fuel may remain in the fuel tubes and fuel filter after releasing the fuel system pressure. Upon disconnecting or removing any fuel-related component, carefully drain residual fuel into a suitable container.  
  
Disconnect the fuel tube-to-fuel rail spring lock coupling. For additional information, refer to [Section 310-00](#) .
5. Disconnect the fuel vapor test port tube-to-fuel vapor tube quick connect coupling. For additional information, refer to [Section 310-00](#) .
6. Remove front bumper cover. For additional information, refer to [Section 501-19](#) .
7. Remove rear bumper cover. For additional information, refer to [Section 501-19](#) .

**NOTE:** LH is shown, RH is similar.

8. Remove the front 2 body mount nuts.
  - To install, tighten to 55 Nm (41 lb-ft).



9. Using 2 suitable jack stands support the front of the vehicle on the pinch welds.
10. Using 2 suitable jack stands support the rear of the vehicle body on the pinch welds.
11. Disconnect 6 push pin retainers from rear wheel speed sensor wires at rear of frame.
12. Loosen the vehicle frame.
  1. Remove the remaining 14 body mount bolts and the lower insulators.
    - ♦ To install, tighten to 48 Nm (35 lb-ft).



13. Lower the frame assembly approximately 6.35 cm (2.50 inches).
14. Disconnect the fuel tube-to-fuel filter inlet and outlet spring lock couplings. For additional information, refer to [Section 310-00](#).
15. Disconnect the fuel vapor tube-to-fuel vapor tube assembly quick connect coupling. For additional information, refer to [Section 310-00](#).
16. Disconnect the fuel tube-to-Fuel Pump (FP) module spring lock coupling. For additional information, refer to [Section 310-00](#).
17. Remove the 9 fuel tube bundle bolts.
  - To install, tighten to 12 Nm (106 lb-in).
18. Remove the fuel tubes (liquid and vapor) from the vehicle.
19. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these**

**instructions may result in serious personal injury.**

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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## Fuel Filter

### Removal and Installation

**⚠ WARNING:** Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Do not carry personal electronic devices such as cell phones, pagers or audio equipment of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** When handling fuel, always observe fuel handling precautions and be prepared in the event of fuel spillage. Spilled fuel may be ignited by hot vehicle components or other ignition sources. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always disconnect the battery ground cable at the battery when working on an evaporative emission (EVAP) system or fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Shut off the electrical power to the air suspension system prior to hoisting or jacking an air suspension equipped vehicle. Failure to do so may result in unexpected inflation or deflation of the air springs, which may result in shifting of the vehicle during these operations. Failure to follow this instruction may result in serious personal injury.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

2. Release the fuel system pressure. For additional information, refer to Section 310-00 .

3. Disconnect the battery ground cable. For additional information, refer to Section 414-01 .


4. **NOTE:** Some residual fuel may remain in the fuel tubes and fuel filter after releasing the fuel system pressure. Upon disconnecting or removing any fuel-related component, carefully drain residual fuel into a suitable container.

Disconnect the fuel tube-to-fuel filter inlet and outlet spring lock couplings. For additional information, refer to Section 310-00 .

5. Remove the fuel filter.

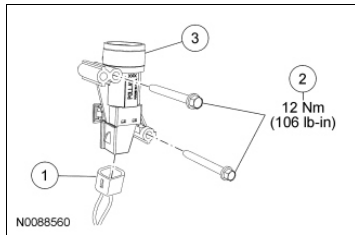
- Release the fuel filter bracket clamp and remove the fuel filter.

- ◆ To install, tighten the clamp to 5 Nm (44 lb-in).

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

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**Inertia Fuel Shutoff (IFS) Switch**

Item	Part Number	Description
1	14A464	Inertia Fuel Shutoff (IFS) switch electrical connector
2	N611042	IFS switch bolts
3	9341	IFS switch

**Removal and Installation**

1. Remove the LH trunk carpet trim.
2. Disconnect the Inertia Fuel Shutoff (IFS) switch electrical connector.
3. **NOTICE:** Do not overtighten the fasteners or damage to the switch will occur.

Remove the 2 bolts and the IFS switch.

- To install, tighten to 12 Nm (106 lb-in).

4. **NOTE:** If necessary, reset the IFS switch after installation has been completed.

To install, reverse the removal procedure.



**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Accelerator pedal bolts	9	80
Accelerator pedal nuts	9	80

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## **Acceleration Control**

The acceleration controls consist of the accelerator pedal and sensor assembly.

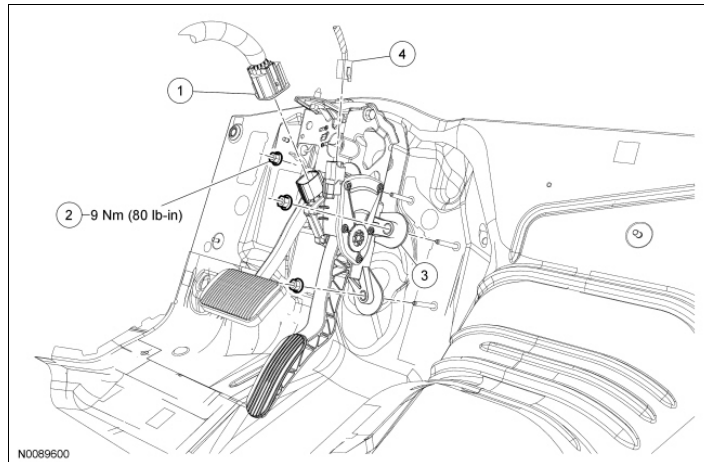
The engine management system electronically operates the throttle of the engine in response to accelerator pedal movements initiated by the driver. In the event of a system failure, the engine management system provides a "limp home" mode which allows the car to be driven with limited performance.

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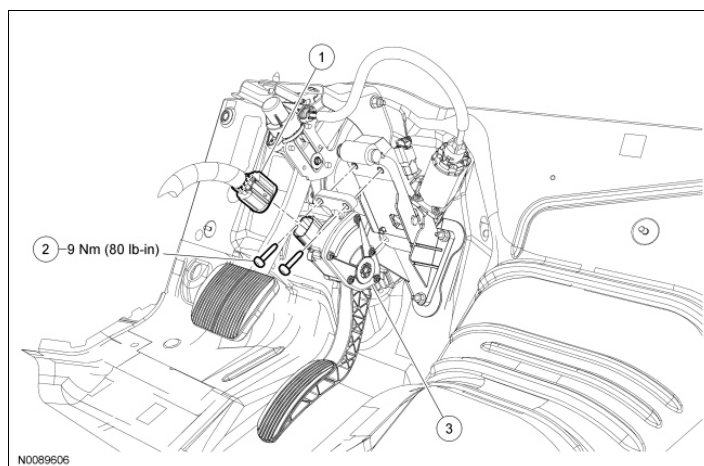
## **Acceleration Control**

Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

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**Accelerator Pedal****Fixed Accelerator Pedal and Sensor Assembly**

Item	Part Number	Description
1	14A464	Accelerator pedal electrical connector
2	N806385	Accelerator pedal nut (3 required)
3	9F836	Accelerator pedal and sensor assembly
4	14489	Accelerator pedal motor electrical connector (if equipped)

**Adjustable Pedal Accelerator Pedal and Sensor Assembly**

Item	Part Number	Description
1	14A464	Accelerator pedal electrical connector
2	W506015	Accelerator pedal bolt (2 required)
3	9F836	Accelerator pedal and sensor assembly

**Removal and Installation**

**All vehicles**

1. **NOTE:** To prevent setting DTCs, make sure the ignition switch is in the OFF position prior to disconnecting the accelerator pedal electrical connector.

Disconnect the accelerator pedal electrical connector.

**Vehicles with adjustable accelerator pedal and sensor assembly**

2. Remove the 2 bolts and the accelerator pedal and sensor assembly.
  - To install, tighten to 9 Nm (80 lb-in).

**Vehicles with fixed accelerator pedal and sensor assembly**

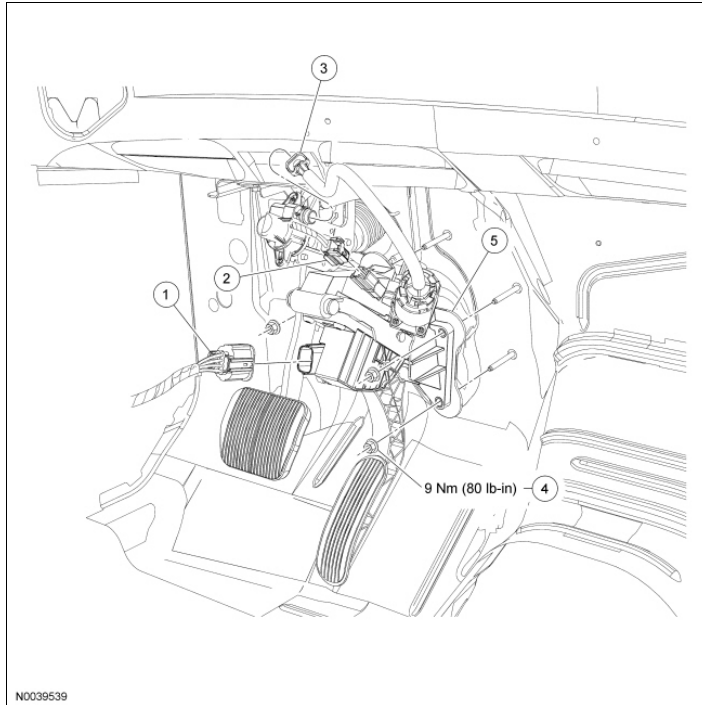
3. If equipped, disconnect the accelerator pedal motor electrical connector.
4. Remove the 3 nuts and the accelerator pedal and sensor assembly.
  - To install, tighten to 9 Nm (80 lb-in).

**All vehicles**

5. To install, reverse the removal procedure.
-

## Accelerator Pedal and Bracket

### Adjustable Accelerator Pedal and Bracket



Item	Part Number	Description
1	14A464	Accelerator pedal sensor electrical connector
2	14489	Accelerator pedal motor electrical connector
3	9825	Accelerator pedal motor drive cable connector
4	N806385	Accelerator pedal and bracket nut (3 required)
5	9N736	Accelerator pedal and bracket

### Removal

1. **NOTE:** To prevent setting DTCs, make sure the ignition switch is in the OFF position prior to disconnecting the accelerator pedal electrical connectors.

Disconnect the accelerator pedal sensor electrical connector.

2. Disconnect the accelerator pedal motor electrical connector.
3. Disconnect the accelerator pedal motor drive cable connector.
4. Remove the 3 nuts and the accelerator pedal and bracket assembly.

### Installation

1. Install the accelerator pedal and bracket assembly.
2. Install the 3 accelerator pedal and bracket retaining nuts.
  - Tighten to 9 Nm (80 lb-in).

3. Connect the accelerator pedal motor drive cable connector.
  4. Connect the accelerator pedal motor electrical connector.
  5. Connect the accelerator pedal sensor electrical connector.
  6. Carry out the adjustable pedal indexing procedure. For additional information, refer to [Section 206-06](#).
-

## **Acronyms**

4WD - Four-Wheel Drive

ABS - Acrylonitrile Butadiene Styrene

ABS - Anti-Lock Brake System

ACL - Air Cleaner

ACM - Audio Control Module

ACM - Audio Front Control Module

AJB - Auxiliary Junction Box

ALR - Automatic Locking Retractor

APP - Accelerator Pedal Position

BARO - Barometric Pressure

BJB - Battery Junction Box

BPP - Brake Pedal Position

BSIA - Brake Shift Interlock Actuator

BTDC - Before Top Dead Center

BTS - Belt Tension Sensor

CAN - Controller Area Network

CASS - Compressor Anti-Slugging Strategy

CCA - Cold Cranking Amps

CHT - Cylinder Head Temperature

CJB - Central Junction Box

CKP - Crankshaft Position

CMDTC - Continuous Memory Diagnostic Trouble Code

CMDTCs - Continuous Memory Diagnostic Trouble Codes

CMP - Camshaft Position

CMS - Catalyst Monitor Sensor

CPP - Clutch Pedal Position

D/A - Dual Action

DDM - Driver Door Module

DERU - Drive Engine Run-Up

DLC - Data Link Connector

DRL - Daytime Running Lamps

DTE - Distance To Empty

EATC - Electronic Automatic Temperature Control

EBD - Electronic Brake Distribution

ECM - Engine Control Module

ECT - Engine Coolant Temperature

ECU - Electronic Control Unit

EGR - Exhaust Gas Recirculation

EI - Electronic Ignition

ELR - Emergency Locking Retractor

EONV - Engine Off Natural Vacuum

EOP - Engine Oil Pressure

EOTC - Engine Only Traction Control

EPC - Electronic Pressure Control

ETB - Electronic Throttle Body

ETC - Electronic Throttle Control

EVA - Electronic Vibration Analyzer

EVAP - Evaporative Emission

FC - Fan Control

FEAD - Front End Accessory Drive

FIA - Factory Invoiced Accessory

FLVV - Fuel Limit Vent Valve

FP - Fuel Pump



FPDM - Fuel Pump Driver Module

FRP - Fuel Rail Pressure

FSSM - Fire Suppression System Module

FTP - Fuel Tank Pressure

FWD - Front Wheel Drive

GEM - Generic Electronic Module

GOP - Grille Opening Panel

GVWR - Gross Vehicle Weight Rating

HCU - Hydraulic Control Unit

HO2S - Heated Oxygen Sensor

HS-CAN - High Speed Controller Area Network

HSLA - High-Strength Low Alloy

IAT - Intake Air Temperature

IC - Instrument Cluster

IDS - Integrated Diagnostic System

IFS - Inertia Fuel Shutoff

IPM-A - Image Processing Module - A

KAM - Keep Alive Memory

KOEO - Key ON Engine OFF

KOER - Key ON Engine Running

KS - Knock Sensor

LCM - Lighting Control Module

LFC - Lamp Fault Code

LFCs - Lamp Fault Codes

LPC - Line Pressure Control

LWB - Long Wheel Base

MACS - Mobile Air Conditioning Society

MAF - Mass Air Flow

MAP - Manifold Absolute Pressure

MEK - Methyl Ethyl Ketone

MFI - Multi-Port Fuel Injection

MIG - Metal Inert Gas

MIL - Malfunction Indicator Lamp

MS-CAN - Medium Speed Controller Area Network

NERU - Neutral Engine Run-Up

NOX - Nitrogen Oxides

NVM - Non-Volatile Memory

O/D - Overdrive

OASIS - On-Line Automotive Service Information System

OBD - On-Board Diagnostic

OCS - Occupant Classification Sensor

OCS - Occupant Classification System

OCSM - Occupant Classification System Module

ORVR - On-Board Refueling Vapor Recovery

OSS - Output Shaft Speed

OTA - Oil-To-Air

OWC - One-Way Clutch

PAD - Passenger Air Bag Deactivation

PATS - Passive Anti-Theft System

PC/ED - Powertrain Control/Emissions Diagnosis

PCA - Pressure Control Solenoid A

PMI - Programmable Module Installation

PSP - Power Steering Pressure

PTU - Power Transfer Unit

PVC - Polyvinyl Chloride

PWM - Pulse Width Modulated

PWM - Pulse-Width Modulation

RAM - Random Access Memory

RCM - Restraints Control Module

RFI - Radio Frequency Interference

RKE - Remote Keyless Entry

ROM - Read-Only Memory

ROW - Rest Of World

RWD - Rear Wheel Drive

SCP - Standard Corporate Protocol

SFI - Sequential Multi-Port Fuel Injection

SJB - Smart Junction Box

SMC - Sheet-Molded Composite

SRS - Supplemental Restraint System

SSA - Shift Solenoid A

SSB - Shift Solenoid B

STRW - Squeeze-Type Resistance Spot Welding

TB - Throttle Body

TCC - Torque Converter Clutch

TCIL - Transmission Control Indicator Lamp

TCS - Transmission Control Switch

TDC - Top Dead Center

TFT - Transmission Fluid Temperature

TIC - Transmitter Identification Code

TICs - Transmitter Identification Codes

TIR - Total Indicated Runout

TP - Throttle Position

TPMS - Tire Pressure Monitoring System

TPO - Thermoplastic Olefin

TR - Transmission Range

TSS - Turbine Shaft Speed

TXV - Thermostatic Expansion Valve

UHSS - Ultra High Strength Steel

VC - Vehicle Certification

VCM - Vehicle Communication Module

VCT - Variable Camshaft Timing

VDM - Vehicle Dynamics Module

VF - Vacuum Fluorescent

VID - Vehicle Identification

VIL - Vehicle Identification Label

VIN - Vehicle Identification Number

VSS - Vehicle Speed Sensor

WMI - World Manufacturer Identifier

WOT - Wide Open Throttle

## Alphabetical Index

1 | 2 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W

---

### 1

1-2 Accumulator (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

### 2

2-3 Accumulator (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

## A

Acceleration Control (DESCRIPTION AND OPERATION)

Acceleration Control (DIAGNOSIS AND TESTING)

Acceleration Control (Section Table of Contents)

Acceleration Control (SPECIFICATIONS)

Accelerator Pedal (REMOVAL AND INSTALLATION, Acceleration Control)

Accelerator Pedal and Bracket (REMOVAL AND INSTALLATION, Acceleration Control)

Accessory Drive (DESCRIPTION AND OPERATION)

Accessory Drive (DIAGNOSIS AND TESTING)

Accessory Drive (Section Table of Contents)

Accessory Drive (SPECIFICATIONS)

Accessory Drive Belt (REMOVAL AND INSTALLATION, Accessory Drive)

Accessory Drive Belt Idler Pulley (REMOVAL AND INSTALLATION, Accessory Drive)

Accessory Drive Belt Tensioner (REMOVAL AND INSTALLATION, Accessory Drive)

Adhesives (DESCRIPTION AND OPERATION, Body Repairs)

Adjustable Pedal Indexing (GENERAL PROCEDURES, Hydraulic Brake Actuation)

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (DESCRIPTION AND OPERATION, Supplemental Restraint System)

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (DIAGNOSIS AND TESTING, Supplemental Restraint System)

Air Cleaner (REMOVAL AND INSTALLATION, Intake Air Distribution and Filtering)

Air Cleaner Element (REMOVAL AND INSTALLATION, Intake Air Distribution and Filtering)

Air Cleaner Outlet Pipe (REMOVAL AND INSTALLATION, Intake Air Distribution and Filtering)

Air Conditioning (DESCRIPTION AND OPERATION, Climate Control)

Air Conditioning (A/C) Clutch Air Gap Adjustment (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Air Conditioning (A/C) Compressor (REMOVAL AND INSTALLATION, Climate Control)

Air Conditioning (A/C) Odor Treatment (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Air Conditioning (A/C) Pressure Relief Valve (REMOVAL AND INSTALLATION, Climate Control)

Air Conditioning (A/C) System Flushing (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Air Conditioning (A/C) System Recovery, Evacuation and Charging (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Air Distribution and Filtering (DESCRIPTION AND OPERATION, Climate Control)

Air Inlet Duct (REMOVAL AND INSTALLATION, Climate Control)

Air Leaks (GENERAL PROCEDURES, Vehicle Dynamic Suspension)

Air Line Fluid Purge (GENERAL PROCEDURES, Vehicle Dynamic Suspension)

Air Spring (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Air Spring Inflation and Deflation (GENERAL PROCEDURES, Vehicle Dynamic Suspension)

Air Spring Refold (GENERAL PROCEDURES, Vehicle Dynamic Suspension)

Air Spring Solenoid Valve (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Air Suspension Compressor (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Air Suspension Compressor Drier (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Air Suspension Switch (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Ambient Air Temperature Sensor (REMOVAL AND INSTALLATION, Climate Control)

Antenna (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Antenna Lead-In Cable (REMOVAL AND INSTALLATION, Information and Entertainment Systems)

[Antenna Module \(REMOVAL AND INSTALLATION, Information and Entertainment Systems\)](#)

[Anti-Lock Brake System \(ABS\) Module \(REMOVAL AND INSTALLATION, Vehicle Dynamic Systems\)](#)

[Anti-Lock Control \(DESCRIPTION AND OPERATION, Vehicle Dynamic Systems\)](#)

[Anti-Lock Control \(DIAGNOSIS AND TESTING, Vehicle Dynamic Systems\)](#)

[Anti-Theft \(DESCRIPTION AND OPERATION, Anti-Theft - Passive Anti-Theft System \(PATS\)\)](#)

[Anti-Theft \(DIAGNOSIS AND TESTING, Anti-Theft - Passive Anti-Theft System \(PATS\)\)](#)

[Anti-Theft Security Access \(GENERAL PROCEDURES, Anti-Theft - Passive Anti-Theft System \(PATS\)\)](#)

[Anti-Theft - Passive Anti-Theft System \(PATS\) \(Section Table of Contents\)](#)

[Apply Components \(DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E\)](#)

[Audio Unit \(REMOVAL AND INSTALLATION, Information and Entertainment Systems\)](#)

[Audio Unit Part Number Retrieval \(GENERAL PROCEDURES, Information and Entertainment Systems\)](#)

[Autolamps \(DIAGNOSIS AND TESTING, Exterior Lighting\)](#)

[Autolamps Time Delay Adjustment \(GENERAL PROCEDURES, Exterior Lighting\)](#)

[Autolock and Auto-Unlock Programming \(GENERAL PROCEDURES, Handles, Locks, Latches and Entry Systems\)](#)

[Automatic Transaxle/Transmission External Controls \(Section Table of Contents\)](#)

[Automatic Transaxle/Transmission External Controls \(SPECIFICATIONS\)](#)

[Automatic Transaxle/Transmission - 4R70E/4R75E \(Section Table of Contents\)](#)

[Automatic Transaxle/Transmission - 4R70E/4R75E \(SPECIFICATIONS\)](#)

[Axle Assembly \(REMOVAL AND INSTALLATION, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear\)](#)

[Axle Shaft \(IN-VEHICLE REPAIR, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear\)](#)

## **B**

[B-Pillar Trim Panel \(REMOVAL AND INSTALLATION, Interior Trim and Ornamentation\)](#)

[Ball Joint - Lower \(REMOVAL AND INSTALLATION, Front Suspension\)](#)

[Ballistic Door Panel \(REMOVAL AND INSTALLATION, Body Repairs\)](#)

[Battery \(REMOVAL AND INSTALLATION, Battery, Mounting and Cables\)](#)

Battery and Battery Tray - Exploded View (REMOVAL AND INSTALLATION, Battery, Mounting and Cables)

Battery and Cables (DESCRIPTION AND OPERATION, Battery, Mounting and Cables)

Battery Cables (REMOVAL AND INSTALLATION, Battery, Mounting and Cables)

Battery Disconnect (GENERAL PROCEDURES, Battery, Mounting and Cables)

Battery Tray (REMOVAL AND INSTALLATION, Battery, Mounting and Cables)

Battery, Mounting and Cables (Section Table of Contents)

Battery, Mounting and Cables (SPECIFICATIONS)

Bearing Inspection (GENERAL PROCEDURES, Engine System - General Information)

Belt-Minder® Deactivating/Activating (GENERAL PROCEDURES, Instrumentation, Message Center, and Warning Chimes)

Block Heater (REMOVAL AND INSTALLATION, Engine Cooling)

Blower Motor (REMOVAL AND INSTALLATION, Climate Control)

Blower Motor Speed Control (REMOVAL AND INSTALLATION, Climate Control)

Blower Motor Switch (REMOVAL AND INSTALLATION, Climate Control)

Body (DESCRIPTION AND OPERATION, Body Repairs)

Body Closures (Section Table of Contents)

Body Closures (SPECIFICATIONS)

Body Repairs (Section Table of Contents)

Body Repairs (SPECIFICATIONS)

Body Sealer Types And Applications (DESCRIPTION AND OPERATION, Body System - General Information)

Body Side Moulding (REMOVAL AND INSTALLATION, Exterior Trim and Ornamentation)

Body System (DIAGNOSIS AND TESTING, Body System - General Information)

Body System - General Information (Section Table of Contents)

Body System - General Information (SPECIFICATIONS)

Brake Booster (DESCRIPTION AND OPERATION, Power Brake Actuation)

Brake Booster (REMOVAL AND INSTALLATION, Power Brake Actuation)

Brake Caliper (REMOVAL AND INSTALLATION, Front Disc Brake)



Brake Caliper (REMOVAL AND INSTALLATION, Rear Disc Brake)

Brake Caliper Anchor Plate (REMOVAL AND INSTALLATION, Front Disc Brake)

Brake Caliper Anchor Plate (REMOVAL AND INSTALLATION, Rear Disc Brake)

Brake Disc (REMOVAL AND INSTALLATION, Front Disc Brake)

Brake Disc (REMOVAL AND INSTALLATION, Rear Disc Brake)

Brake Disc Machining (GENERAL PROCEDURES, Brake System - General Information)

Brake Flexible Hose (REMOVAL AND INSTALLATION, Front Disc Brake)

Brake Flexible Hose (REMOVAL AND INSTALLATION, Rear Disc Brake)

Brake Fluid Reservoir (REMOVAL AND INSTALLATION, Hydraulic Brake Actuation)

Brake Master Cylinder (REMOVAL AND INSTALLATION, Hydraulic Brake Actuation)

Brake Pads (REMOVAL AND INSTALLATION, Front Disc Brake)

Brake Pads (REMOVAL AND INSTALLATION, Rear Disc Brake)

Brake Pedal and Bracket (REMOVAL AND INSTALLATION, Hydraulic Brake Actuation)

Brake Shift Interlock Actuator (REMOVAL AND INSTALLATION, Automatic Transaxle/Transmission External Controls)

Brake System (DESCRIPTION AND OPERATION, Brake System - General Information)

Brake System Bleeding (GENERAL PROCEDURES, Brake System - General Information)

Brake System Inspection (GENERAL PROCEDURES, Brake System - General Information)

Brake System - General Information (Section Table of Contents)

Brake System - General Information (SPECIFICATIONS)

Bumper Bracket - Front (REMOVAL AND INSTALLATION, Bumpers)

Bumper Bracket - Rear (REMOVAL AND INSTALLATION, Bumpers)

Bumper Cover - Front (REMOVAL AND INSTALLATION, Bumpers)

Bumper Cover - Rear (REMOVAL AND INSTALLATION, Bumpers)

Bumper Isolator - Front (REMOVAL AND INSTALLATION, Bumpers)

Bumper - Exploded View, Front (REMOVAL AND INSTALLATION, Bumpers)

Bumper - Exploded View, Rear (REMOVAL AND INSTALLATION, Bumpers)

Bumper - Front (REMOVAL AND INSTALLATION, Bumpers)

Bumper - Rear (REMOVAL AND INSTALLATION, Bumpers)

Bumpers (Section Table of Contents)

Bumpers (SPECIFICATIONS)

Bushings, Bearing and Thrust Washer Locator (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

## C

Camber and Caster Adjustment (GENERAL PROCEDURES, Suspension System - General Information)

Camshaft (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Camshaft Bearing Journal Diameter (GENERAL PROCEDURES, Engine System - General Information)

Camshaft End Play - OHC Engines (GENERAL PROCEDURES, Engine System - General Information)

Camshaft Journal to Bearing Clearance - OHC Engines (GENERAL PROCEDURES, Engine System - General Information)

Camshaft Lobe Lift (GENERAL PROCEDURES, Engine System - General Information)

Camshaft Position (CMP) Sensor (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Camshaft Roller Follower (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Camshaft Runout (GENERAL PROCEDURES, Engine System - General Information)

Camshaft Surface Inspection (GENERAL PROCEDURES, Engine System - General Information)

Catalyst Monitor Sensor (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Catalytic Converter (REMOVAL AND INSTALLATION, Exhaust System)

Charging System (DESCRIPTION AND OPERATION)

Charging System (Section Table of Contents)

Charging System (SPECIFICATIONS)

Child Safety Seat Tether Anchor (REMOVAL AND INSTALLATION, Safety Belt System)

Child Safety Seat Tether Anchor - LATCH (REMOVAL AND INSTALLATION, Safety Belt System)

Climate Control (Section Table of Contents)

Climate Control (SPECIFICATIONS)

Climate Control Assembly (REMOVAL AND INSTALLATION, Climate Control)

Climate Control System (DESCRIPTION AND OPERATION, Climate Control System - General Information and Diagnostics)

Climate Control System (DIAGNOSIS AND TESTING, Climate Control System - General Information and Diagnostics)

Climate Control System - General Information and Diagnostics (Section Table of Contents)

Climate Control System - General Information and Diagnostics (SPECIFICATIONS)

Clockspring (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Clutch and Clutch Field Coil (REMOVAL AND INSTALLATION, Climate Control)

Communications Network (DESCRIPTION AND OPERATION, Module Communications Network)

Communications Network (DIAGNOSIS AND TESTING, Module Communications Network)

Component Bleeding (GENERAL PROCEDURES, Brake System - General Information)

Component Test (DIAGNOSIS AND TESTING, Battery, Mounting and Cables)

Component Tests (DIAGNOSIS AND TESTING, Brake System - General Information)

Compressor to Condenser Discharge Line (REMOVAL AND INSTALLATION, Climate Control)

Condenser Core (REMOVAL AND INSTALLATION, Climate Control)

Condenser to Evaporator Line (REMOVAL AND INSTALLATION, Climate Control)

Connecting Rod Bearing Journal Taper and Out-of-Round (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod Bearing Journal-to-Bearing Clearance (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod Bend (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod Bushing Diameter (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod Cleaning (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod Large End Bore (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod to Crankshaft Side Clearance (GENERAL PROCEDURES, Engine System - General Information)

Connecting Rod Twist (GENERAL PROCEDURES, Engine System - General Information)

Console - Overhead (REMOVAL AND INSTALLATION, Instrument Panel and Console)

Control Components (DESCRIPTION AND OPERATION, Climate Control)

Coolant Pump (REMOVAL AND INSTALLATION, Engine Cooling)

[Cooling Fan Motor and Shroud \(REMOVAL AND INSTALLATION, Engine Cooling\)](#)

[Cooling System Draining, Filling and Bleeding \(GENERAL PROCEDURES, Engine Cooling\)](#)

[Cooling System Flushing \(GENERAL PROCEDURES, Engine Cooling\)](#)

[Core Plug Replacement \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Cowl Panel Grille \(REMOVAL AND INSTALLATION, Front End Body Panels\)](#)

[Crankcase Ventilation Tube \(REMOVAL AND INSTALLATION, Engine Emission Control\)](#)

[Crankshaft End Play \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Crankshaft Front Seal \(IN-VEHICLE REPAIR, Engine - 4.6L \(2V\)\)](#)

[Crankshaft Main Bearing Journal Diameter \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Crankshaft Main Bearing Journal Taper and Out-of-Round \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Crankshaft Main Bearing Journal-to-Bearing Clearance \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Crankshaft Position \(CKP\) Sensor \(REMOVAL AND INSTALLATION, Electronic Engine Controls\)](#)

[Crankshaft Pulley \(IN-VEHICLE REPAIR, Engine - 4.6L \(2V\)\)](#)

[Crankshaft Rear Seal \(IN-VEHICLE REPAIR, Engine - 4.6L \(2V\)\)](#)

[Crankshaft Rear Seal with Retainer Plate \(IN-VEHICLE REPAIR, Engine - 4.6L \(2V\)\)](#)

[Crossmember - Number 2 \(REMOVAL AND INSTALLATION, Full Frame and Body Mounting\)](#)

[Cruise Control \(DESCRIPTION AND OPERATION\)](#)

[Cruise Control \(DIAGNOSIS AND TESTING\)](#)

[Cruise Control \(Section Table of Contents\)](#)

[Cruise Control \(SPECIFICATIONS\)](#)

[Cruise Control Deactivator Switch \(REMOVAL AND INSTALLATION, Cruise Control\)](#)

[Cruise Control Switch \(REMOVAL AND INSTALLATION, Cruise Control\)](#)

[Cylinder Block Distortion \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Cylinder Bore Cleaning \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Cylinder Bore Out-of-Round \(GENERAL PROCEDURES, Engine System - General Information\)](#)

[Cylinder Bore Taper \(GENERAL PROCEDURES, Engine System - General Information\)](#)

Cylinder Head (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Engine - 4.6L (2V))

Cylinder Head (INSTALLATION, Engine - 4.6L (2V))

Cylinder Head (REMOVAL, Engine - 4.6L (2V))

Cylinder Head Distortion (GENERAL PROCEDURES, Engine System - General Information)

Cylinder Head Temperature (CHT) Sensor (REMOVAL AND INSTALLATION, Electronic Engine Controls)

## **D**

Daytime Running Lamps (DRL) (DIAGNOSIS AND TESTING, Exterior Lighting)

Degas Bottle (REMOVAL AND INSTALLATION, Engine Cooling)

Diagnosis By Symptom (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Diagnostic Flow Chart (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Diagnostic Parameters Identification (PID) Chart (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Diagnostic Strategy (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Diagnostic Trouble Code (DTC) Chart (DIAGNOSIS AND TESTING, Charging System)

Diagnostic Trouble Code (DTC) Chart (DIAGNOSIS AND TESTING, Exterior Lighting)

Diagnostic Trouble Code (DTC) Chart (DIAGNOSIS AND TESTING, Multifunction Electronic Modules)

Diagnostic Trouble Code (DTC) Charts (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Diagnostics (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Differential Bearings (IN-VEHICLE REPAIR, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Differential Carrier (REMOVAL AND INSTALLATION, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Differential Case and Ring Gear - Conventional (DISASSEMBLY AND ASSEMBLY, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Differential Case and Ring Gear - Traction-Lok (DISASSEMBLY AND ASSEMBLY, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Differential Housing Cover (IN-VEHICLE REPAIR, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Differential Ring And Pinion (IN-VEHICLE REPAIR, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Digital Transmission Range (TR) Sensor (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Disc Brake System - Exploded View (REMOVAL AND INSTALLATION, Rear Disc Brake)

Door Ajar Switch - Front (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Door Ajar Switch - Rear Door (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Door Alignment - Front (GENERAL PROCEDURES, Body Closures)

Door Alignment - Rear (GENERAL PROCEDURES, Body Closures)

Door Glass Top Run - Front (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Door Handle to Latch Rod Adjustment (GENERAL PROCEDURES, Handles, Locks, Latches and Entry Systems)

Door Lock Control Switch (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Door Lock Cylinder (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Door Speaker (REMOVAL AND INSTALLATION, Information and Entertainment Systems)

Door Trim Panel - Front (REMOVAL AND INSTALLATION, Interior Trim and Ornamentation)

Door Trim Panel - Rear (REMOVAL AND INSTALLATION, Interior Trim and Ornamentation)

Door - Front (REMOVAL AND INSTALLATION, Body Closures)

Door - Rear (REMOVAL AND INSTALLATION, Body Closures)

Drive Pinion Flange and Drive Pinion Seal (IN-VEHICLE REPAIR, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Driveline Angle Measurement (GENERAL PROCEDURES, Driveline System - General Information)

Driveline System (DESCRIPTION AND OPERATION, Driveline System - General Information)

Driveline System (DIAGNOSIS AND TESTING, Driveline System - General Information)

Driveline System - General Information (Section Table of Contents)

Driveline System - General Information (SPECIFICATIONS)

Driver Air Bag Module (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Driver Door Module (DDM) (DIAGNOSIS AND TESTING, Multifunction Electronic Modules)

Driver Door Module (DDM) (REMOVAL AND INSTALLATION, Multifunction Electronic Modules)

Driveshaft (DESCRIPTION AND OPERATION)

Driveshaft (DIAGNOSIS AND TESTING)

Driveshaft (REMOVAL AND INSTALLATION)

Driveshaft (Section Table of Contents)

Driveshaft (SPECIFICATIONS)

Driveshaft Runout and Balancing (GENERAL PROCEDURES, Driveline System - General Information)

Driveshaft Universal Joint (DISASSEMBLY AND ASSEMBLY, Driveshaft)

Dust Separator (REMOVAL AND INSTALLATION, Evaporative Emissions)

## **E**

Electronic Engine Controls (DESCRIPTION AND OPERATION)

Electronic Engine Controls (DIAGNOSIS AND TESTING)

Electronic Engine Controls (Section Table of Contents)

Electronic Engine Controls (SPECIFICATIONS)

Electronic Leak Detection (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Electronic Pressure Control (EPC) Solenoid (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Engine (ASSEMBLY, Engine - 4.6L (2V))

Engine (DESCRIPTION AND OPERATION, Engine System - General Information)

Engine (DESCRIPTION AND OPERATION, Engine - 4.6L (2V))

Engine (DIAGNOSIS AND TESTING, Engine System - General Information)

Engine (DIAGNOSIS AND TESTING, Engine - 4.6L (2V))

Engine (DISASSEMBLY, Engine - 4.6L (2V))

Engine (INSTALLATION, Engine - 4.6L (2V))

Engine (REMOVAL, Engine - 4.6L (2V))

Engine Cooling (DESCRIPTION AND OPERATION)

Engine Cooling (DIAGNOSIS AND TESTING)

Engine Cooling (Section Table of Contents)

Engine Cooling (SPECIFICATIONS)

Engine Emission Control (DESCRIPTION AND OPERATION)

Engine Emission Control (DIAGNOSIS AND TESTING)

Engine Emission Control (Section Table of Contents)

Engine Emission Control (SPECIFICATIONS)

Engine Front Cover (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Engine Ignition (DESCRIPTION AND OPERATION, Engine Ignition - 4.6L (2V))

Engine Ignition (DIAGNOSIS AND TESTING, Engine Ignition - 4.6L (2V))

Engine Ignition Components - Exploded View (REMOVAL AND INSTALLATION, Engine Ignition - 4.6L (2V))

Engine Ignition - 4.6L (2V) (Section Table of Contents)

Engine Ignition - 4.6L (2V) (SPECIFICATIONS)

Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Engine Mount - LH (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Engine Mount - RH (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Engine Oil Pressure (EOP) Switch (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Engine System - General Information (Section Table of Contents)

Engine System - General Information (SPECIFICATIONS)

Engine - 4.6L (2V) (Section Table of Contents)

Engine - 4.6L (2V) (SPECIFICATIONS)

Evaporative Emission Canister (REMOVAL AND INSTALLATION, Evaporative Emissions)

Evaporative Emission Canister Purge Valve (REMOVAL AND INSTALLATION, Evaporative Emissions)

Evaporative Emission Canister Vent Solenoid (REMOVAL AND INSTALLATION, Evaporative Emissions)

Evaporative Emission System Leak Test (GENERAL PROCEDURES, Evaporative Emissions)

Evaporative Emissions (DESCRIPTION AND OPERATION)

Evaporative Emissions (DIAGNOSIS AND TESTING)

Evaporative Emissions (Section Table of Contents)



Evaporative Emissions (SPECIFICATIONS)

Evaporator Core (REMOVAL AND INSTALLATION, Climate Control)

Evaporator Core Housing (REMOVAL AND INSTALLATION, Climate Control)

Evaporator Core Orifice (REMOVAL AND INSTALLATION, Climate Control)

Exhaust Gas Recirculation (EGR) System Components - Exploded View (REMOVAL AND INSTALLATION, Engine Emission Control)

Exhaust Gas Recirculation (EGR) System Module (REMOVAL AND INSTALLATION, Engine Emission Control)

Exhaust Gas Recirculation (EGR) System Module Tube (REMOVAL AND INSTALLATION, Engine Emission Control)

Exhaust Manifold Cleaning and Inspection (GENERAL PROCEDURES, Engine System - General Information)

Exhaust Manifold - LH (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Exhaust Manifold - RH (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Exhaust System (DESCRIPTION AND OPERATION)

Exhaust System (DIAGNOSIS AND TESTING)

Exhaust System (Section Table of Contents)

Exhaust System (SPECIFICATIONS)

Exhaust System Alignment (GENERAL PROCEDURES, Exhaust System)

Exhaust System - Exploded View (REMOVAL AND INSTALLATION, Exhaust System)

Extension Housing Gasket (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Extension Housing Seal (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Exterior Front Door Handle (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Exterior Lighting (DESCRIPTION AND OPERATION)

Exterior Lighting (Section Table of Contents)

Exterior Lighting (SPECIFICATIONS)

Exterior Mirror (REMOVAL AND INSTALLATION, Rear View Mirrors)

Exterior Mirror Control Switch (REMOVAL AND INSTALLATION, Rear View Mirrors)

Exterior Mirror Cover (REMOVAL AND INSTALLATION, Rear View Mirrors)

Exterior Mirror Glass (REMOVAL AND INSTALLATION, Rear View Mirrors)

Exterior Mirror Motor (REMOVAL AND INSTALLATION, Rear View Mirrors)

Exterior Mirrors - Exploded View (REMOVAL AND INSTALLATION, Rear View Mirrors)

Exterior Rear Door Handle (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Exterior Trim and Ornamentation (Section Table of Contents)

Exterior Trim and Ornamentation (SPECIFICATIONS)

External Controls (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission External Controls)

External Controls (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission External Controls)

## **F**

Fender (REMOVAL AND INSTALLATION, Front End Body Panels)

Fender Splash Shield - LH (REMOVAL AND INSTALLATION, Front End Body Panels)

Fender Splash Shield - RH (REMOVAL AND INSTALLATION, Front End Body Panels)

Fill Limiting Vent Valve (REMOVAL AND INSTALLATION, Evaporative Emissions)

Fire Suppression Manifold (REMOVAL AND INSTALLATION, Fire Suppression System)

Fire Suppression Manual Switch (REMOVAL AND INSTALLATION, Fire Suppression System)

Fire Suppression System (DESCRIPTION AND OPERATION)

Fire Suppression System (DIAGNOSIS AND TESTING)

Fire Suppression System (Section Table of Contents)

Fire Suppression System (SPECIFICATIONS)

Fire Suppression System Depowering and Repowering (GENERAL PROCEDURES, Fire Suppression System)

Fire Suppression System Module (FSSM) (REMOVAL AND INSTALLATION, Fire Suppression System)

Fire Suppressor (REMOVAL AND INSTALLATION, Fire Suppression System)

Flexplate (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Flexplate Inspection (GENERAL PROCEDURES, Engine System - General Information)

Fluid Pan, Gasket and Filter (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Fluorescent Dye Leak Detection (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Fog Lamp (REMOVAL AND INSTALLATION, Exterior Lighting)

Fog Lamp Bulb (REMOVAL AND INSTALLATION, Exterior Lighting)

Fog Lamps (DIAGNOSIS AND TESTING, Exterior Lighting)

Footwell Duct - Rear (REMOVAL AND INSTALLATION, Climate Control)

Forward Clutch Cylinder (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Frame and Body Mounting (DESCRIPTION AND OPERATION, Full Frame and Body Mounting)

Frame Members (REMOVAL AND INSTALLATION, Body Repairs)

Front Disc Brake (DESCRIPTION AND OPERATION)

Front Disc Brake (DIAGNOSIS AND TESTING)

Front Disc Brake (Section Table of Contents)

Front Disc Brake (SPECIFICATIONS)

Front Door Handles, Locks and Latches - Exploded View (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Front Door Latch (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Front Door Lock Actuator (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Front End Accessory Drive (FEAD) - Exploded View (REMOVAL AND INSTALLATION, Accessory Drive)

Front End Body Panels (Section Table of Contents)

Front End Body Panels (SPECIFICATIONS)

Front Fog Lamp Adjustment (GENERAL PROCEDURES, Exterior Lighting)

Front Impact Severity Sensor (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Front Suspension (DESCRIPTION AND OPERATION)

Front Suspension (DIAGNOSIS AND TESTING)

Front Suspension (Section Table of Contents)

Front Suspension (SPECIFICATIONS)

Fuel Charging and Controls (DESCRIPTION AND OPERATION, Fuel Charging and Controls - 4.6L (2V))

Fuel Charging and Controls (DIAGNOSIS AND TESTING, Fuel Charging and Controls - 4.6L (2V))

Fuel Charging and Controls - 4.6L (2V) (Section Table of Contents)

Fuel Charging and Controls - 4.6L (2V) (SPECIFICATIONS)

Fuel Filter (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Injectors (REMOVAL AND INSTALLATION, Fuel Charging and Controls - 4.6L (2V))

Fuel Level Sender (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Lines (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Lines and Fuel Filter - Exploded View (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Pump Driver Module (FPDM) (REMOVAL AND INSTALLATION, Fuel Charging and Controls - 4.6L (2V))

Fuel Pump Module (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Rail (REMOVAL AND INSTALLATION, Fuel Charging and Controls - 4.6L (2V))

Fuel Rail and Fuel Injector - Exploded View (REMOVAL AND INSTALLATION, Fuel Charging and Controls - 4.6L (2V))

Fuel Rail Pressure and Temperature Sensor (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Fuel System (DESCRIPTION AND OPERATION, Fuel System - General Information)

Fuel System (DIAGNOSIS AND TESTING, Fuel System - General Information)

Fuel System Pressure Release (GENERAL PROCEDURES, Fuel System - General Information)

Fuel System Pressure Test (GENERAL PROCEDURES, Fuel System - General Information)

Fuel System - General Information (Section Table of Contents)

Fuel System - General Information (SPECIFICATIONS)

Fuel Tank (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Tank and Filler Pipe - Exploded View (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Tank and Lines (DESCRIPTION AND OPERATION)

Fuel Tank and Lines (DIAGNOSIS AND TESTING)

Fuel Tank and Lines (Section Table of Contents)

Fuel Tank and Lines (SPECIFICATIONS)

Fuel Tank Draining (GENERAL PROCEDURES, Fuel System - General Information)

Fuel Tank Filler Pipe (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Fuel Vapor Tube Assembly (REMOVAL AND INSTALLATION, Evaporative Emissions)

Full Frame and Body Mounting (Section Table of Contents)

Full Frame and Body Mounting (SPECIFICATIONS)

Function Selector Switch (REMOVAL AND INSTALLATION, Climate Control)

## **G**

Geartrain (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Generator (REMOVAL AND INSTALLATION, Charging System)

Glass Reseal - Rear (GENERAL PROCEDURES, Glass, Frames and Mechanisms)

Glass Reseal - Windshield (GENERAL PROCEDURES, Glass, Frames and Mechanisms)

Glass, Frames and Mechanisms (DESCRIPTION AND OPERATION)

Glass, Frames and Mechanisms (DIAGNOSIS AND TESTING)

Glass, Frames and Mechanisms (Section Table of Contents)

Glass, Frames and Mechanisms (SPECIFICATIONS)

Glass, Frames and Mechanisms - Exploded View, Front Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Glass, Frames and Mechanisms - Exploded View, Rear Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

## **H**

Handles, Locks, Latches and Entry Systems (DESCRIPTION AND OPERATION)

Handles, Locks, Latches and Entry Systems (DIAGNOSIS AND TESTING)

Handles, Locks, Latches and Entry Systems (Section Table of Contents)

Handles, Locks, Latches and Entry Systems (SPECIFICATIONS)

Headlamp Adjustment (GENERAL PROCEDURES, Exterior Lighting)

Headlamp Assembly (REMOVAL AND INSTALLATION, Exterior Lighting)

Headlamp Bulb (REMOVAL AND INSTALLATION, Exterior Lighting)

Headlamp Switch (REMOVAL AND INSTALLATION, Exterior Lighting)

Headlamps (DIAGNOSIS AND TESTING, Exterior Lighting)

Headliner (REMOVAL AND INSTALLATION, Interior Trim and Ornamentation)

Heated Oxygen Sensor (HO2S) (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor - Exploded View (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Heated Seat Module (REMOVAL AND INSTALLATION, Seating)

Heated Seat Switch (REMOVAL AND INSTALLATION, Seating)

Heater Core (REMOVAL AND INSTALLATION, Climate Control)

Heater Core Backflushing (GENERAL PROCEDURES, Engine Cooling)

Heating and Ventilation (DESCRIPTION AND OPERATION, Climate Control)

Heating Ventilation Air Conditioning (HVAC) Module (REMOVAL AND INSTALLATION, Climate Control)

High Mounted Stoplamp (REMOVAL AND INSTALLATION, Exterior Lighting)

Hood Latch (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Hood Latch and Components - Exploded View (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Hood Latch Release Handle (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Horn (DESCRIPTION AND OPERATION)

Horn (DIAGNOSIS AND TESTING)

Horn (Section Table of Contents)

Horn (SPECIFICATIONS)

Hydraulic Brake Actuation (DESCRIPTION AND OPERATION)

Hydraulic Brake Actuation (Section Table of Contents)

Hydraulic Brake Actuation (SPECIFICATIONS)

Hydraulic Control Unit (HCU) (REMOVAL AND INSTALLATION, Vehicle Dynamic Systems)

Hydraulic Lash Adjuster (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Hydraulic Lash Adjuster Inspection (GENERAL PROCEDURES, Engine System - General Information)

Hydraulic System (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

I

Identification Codes (DESCRIPTION AND OPERATION)

Identification Codes (Section Table of Contents)

Identification Tags (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Ignition Coil-On-Plug (REMOVAL AND INSTALLATION, Engine Ignition - 4.6L (2V))

Ignition Lock Cylinder - Functional (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Ignition Lock Cylinder - Non Functional (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Ignition Switch (REMOVAL AND INSTALLATION, Steering Column Switches)

In-Vehicle Temperature Sensor (REMOVAL AND INSTALLATION, Climate Control)

Inertia Fuel Shutoff (IFS) Switch (REMOVAL AND INSTALLATION, Fuel Tank and Lines)

Information and Entertainment System (DESCRIPTION AND OPERATION, Information and Entertainment Systems)

Information and Entertainment System (DIAGNOSIS AND TESTING, Information and Entertainment Systems)

Information and Entertainment Systems (Section Table of Contents)

Information And Message Center (DESCRIPTION AND OPERATION, Instrumentation, Message Center, and Warning Chimes)

Inner Body Reinforcing Panels (REMOVAL AND INSTALLATION, Body Repairs)

Inner Tie Rod (REMOVAL AND INSTALLATION, Power Steering)

Inspection and Repair After a Supplemental Restraint System (SRS) Deployment (GENERAL PROCEDURES, Supplemental Restraint System)

Inspection And Verification (DIAGNOSIS AND TESTING, Battery, Mounting and Cables)

Inspection And Verification (DIAGNOSIS AND TESTING, Brake System - General Information)

Inspection And Verification (DIAGNOSIS AND TESTING, Charging System)

Inspection And Verification (DIAGNOSIS AND TESTING, Hydraulic Brake Actuation)

I

Instrument Cluster (IC) (DESCRIPTION AND OPERATION, Instrumentation, Message Center, and Warning Chimes)

Instrument Cluster (IC) (REMOVAL AND INSTALLATION, Instrumentation, Message Center, and Warning Chimes)

Instrument Cluster (IC) Lens (REMOVAL AND INSTALLATION, Instrumentation, Message Center, and Warning Chimes)

Instrument Cluster and Panel Illumination (DESCRIPTION AND OPERATION)

Instrument Cluster and Panel Illumination (DIAGNOSIS AND TESTING)

Instrument Cluster and Panel Illumination (Section Table of Contents)

Instrument Cluster Finish Panel (REMOVAL AND INSTALLATION, Instrument Panel and Console)

Instrument Panel (REMOVAL AND INSTALLATION, Instrument Panel and Console)

Instrument Panel and Console (Section Table of Contents)

Instrument Panel and Console (SPECIFICATIONS)

Instrument Panel Dimmer Switch (REMOVAL AND INSTALLATION, Instrument Cluster and Panel Illumination)

Instrument Panel - Exploded View (REMOVAL AND INSTALLATION, Instrument Panel and Console)

Instrumentation, Message Center and Warning Chimes (DIAGNOSIS AND TESTING, Instrumentation, Message Center, and Warning Chimes)

Instrumentation, Message Center, and Warning Chimes (Section Table of Contents)

Insulation (DESCRIPTION AND OPERATION, Body System - General Information)

Intake Air Distribution and Filtering (DESCRIPTION AND OPERATION)

Intake Air Distribution and Filtering (DIAGNOSIS AND TESTING)

Intake Air Distribution and Filtering (Section Table of Contents)

Intake Air Distribution and Filtering (SPECIFICATIONS)

Intake Air System Components - Exploded View (REMOVAL AND INSTALLATION, Intake Air Distribution and Filtering)

Intake Manifold (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Interior Lighting (DESCRIPTION AND OPERATION)

Interior Lighting (DIAGNOSIS AND TESTING)

Interior Lighting (Section Table of Contents)



Interior Rear View Mirror (REMOVAL AND INSTALLATION, Rear View Mirrors)

Interior Trim and Ornamentation (Section Table of Contents)

Interior Trim and Ornamentation (SPECIFICATIONS)

Interior Trim - Exploded View (REMOVAL AND INSTALLATION, Interior Trim and Ornamentation)

Intermediate One-Way Clutch (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

## **J**

Jacking and Lifting (DESCRIPTION AND OPERATION)

Jacking and Lifting (Section Table of Contents)

## **K**

Key Programming Switch State Control (GENERAL PROCEDURES, Anti-Theft - Passive Anti-Theft System (PATS))

Key Programming Using Diagnostic Equipment (GENERAL PROCEDURES, Anti-Theft - Passive Anti-Theft System (PATS))

Key Programming Using Two Programmed Keys (GENERAL PROCEDURES, Anti-Theft - Passive Anti-Theft System (PATS))

Keyless Entry Keypad (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Keyless Entry Keypad Code Programming (GENERAL PROCEDURES, Handles, Locks, Latches and Entry Systems)

Knock Sensor (KS) (REMOVAL AND INSTALLATION, Electronic Engine Controls)

## **L**

Latch Lubrication (GENERAL PROCEDURES, Handles, Locks, Latches and Entry Systems)

Lateral Arm and Watts Link Pivot Assembly (REMOVAL AND INSTALLATION, Rear Suspension)

Lead Terminal Repair (GENERAL PROCEDURES, Glass, Frames and Mechanisms)

Leakage Inspection (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

License Plate Housing (REMOVAL AND INSTALLATION, Exterior Trim and Ornamentation)

Light Sensor (REMOVAL AND INSTALLATION, Exterior Lighting)

Lighting Control Module (LCM) (DIAGNOSIS AND TESTING, Multifunction Electronic Modules)

Lighting Control Module (LCM) (REMOVAL AND INSTALLATION, Multifunction Electronic Modules)

Lower Arm (REMOVAL AND INSTALLATION, Front Suspension)

Lower Arm (REMOVAL AND INSTALLATION, Rear Suspension)

Lower End Components - Exploded View, Crankshaft Pulley and Crankshaft Front Seal (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Lower End Components - Exploded View, Flexplate and Crankshaft Rear Seal with Retainer Plate (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Luggage Compartment Lid (REMOVAL AND INSTALLATION, Body Closures)

Luggage Compartment Lid Alignment (GENERAL PROCEDURES, Body Closures)

Luggage Compartment Lid Latch (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Luggage Compartment Lid Lock Cylinder (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Lumbar Assembly (REMOVAL AND INSTALLATION, Seating)

Lumbar Control Switch (REMOVAL AND INSTALLATION, Seating)

## **M**

Main Components and Functions (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Main Control Valve Body (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Main Control Valve Body (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Maintenance Schedule (Section Table of Contents)

Maintenance Schedules - Gasoline Engines (DESCRIPTION AND OPERATION, Maintenance Schedule)

Manual Control Lever Shaft and Seal (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Mass Air Flow (MAF) Sensor (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Message Center Configuration (GENERAL PROCEDURES, Instrumentation, Message Center, and Warning Chimes)

Message Center Switch (REMOVAL AND INSTALLATION, Instrumentation, Message Center, and Warning Chimes)

Module Communications Network (Section Table of Contents)

Module Configuration (DIAGNOSIS AND TESTING)

Module Configuration (Section Table of Contents)

Module Controlled Functions (DESCRIPTION AND OPERATION, Multifunction Electronic Modules)

Muffler and Tailpipe (REMOVAL AND INSTALLATION, Exhaust System)

Muffler and Tailpipe - Fire Suppression System (REMOVAL AND INSTALLATION, Exhaust System)

Multifunction Electronic Modules (Section Table of Contents)

## **N**

Noise, Vibration and Harshness (Section Table of Contents)

Noise, Vibration and Harshness (NVH) (DESCRIPTION AND OPERATION, Noise, Vibration and Harshness)

Noise, Vibration and Harshness (NVH) (DIAGNOSIS AND TESTING, Noise, Vibration and Harshness)

## **O**

Occupant Classification Sensor (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Oil Cooler (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Oil Filter Adapter (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Oil Level Indicator and Tube (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Oil Pan (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Oil Pump (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Oil Pump Screen and Pickup Tube (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Output Shaft and Direct Clutch Cylinder (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Output Shaft Speed (OSS) Sensor (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Overdrive Servo (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

## **P**

Parcel Shelf (REMOVAL AND INSTALLATION, Interior Trim and Ornamentation)

Parcel Shelf Speaker (REMOVAL AND INSTALLATION, Information and Entertainment Systems)

Parking Brake (DESCRIPTION AND OPERATION, Parking Brake and Actuation)

Parking Brake (DIAGNOSIS AND TESTING, Parking Brake and Actuation)

Parking Brake and Actuation (Section Table of Contents)

Parking Brake and Actuation (SPECIFICATIONS)

Parking Brake Cable Adjustment (GENERAL PROCEDURES, Parking Brake and Actuation)

Parking Brake Cable - Front (REMOVAL AND INSTALLATION, Parking Brake and Actuation)

Parking Brake Cable - Rear (REMOVAL AND INSTALLATION, Parking Brake and Actuation)

Parking Brake Control (REMOVAL AND INSTALLATION, Parking Brake and Actuation)

Parking Brake Shoe Adjustment (GENERAL PROCEDURES, Parking Brake and Actuation)

Parking Brake Shoes (REMOVAL AND INSTALLATION, Parking Brake and Actuation)

Parking, Rear and License Plate Lamps (DIAGNOSIS AND TESTING, Exterior Lighting)

Passenger Air Bag Deactivation (PAD) Indicator (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Passenger Air Bag Module (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Passive Anti-Theft System (PATS) Transceiver (REMOVAL AND INSTALLATION, Anti-Theft - Passive Anti-Theft System (PATS))

Pinpoint Test (DIAGNOSIS AND TESTING, Battery, Mounting and Cables)

Pinpoint Test (DIAGNOSIS AND TESTING, Charging System)

Pinpoint Test (DIAGNOSIS AND TESTING, Hydraulic Brake Actuation)

Pinpoint Tests (DIAGNOSIS AND TESTING, Brake System - General Information)

Pinpoint Tests - OSC Equipped Vehicle (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Piston (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Engine - 4.6L (2V))

Piston Diameter (GENERAL PROCEDURES, Engine System - General Information)

Piston Inspection (GENERAL PROCEDURES, Engine System - General Information)

Piston Pin Bore Diameter (GENERAL PROCEDURES, Engine System - General Information)

Piston Pin Diameter (GENERAL PROCEDURES, Engine System - General Information)

Piston Ring End Gap (GENERAL PROCEDURES, Engine System - General Information)

Piston Ring-to-Groove Clearance (GENERAL PROCEDURES, Engine System - General Information)

Piston Selection (GENERAL PROCEDURES, Engine System - General Information)

Piston To Cylinder Bore Clearance (GENERAL PROCEDURES, Engine System - General Information)

Planetary Gear Support Assembly and Planetary One-Way Clutch (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Plastic Components (DESCRIPTION AND OPERATION, Body Repairs)

Plastics Identification (GENERAL PROCEDURES, Body Repairs)

Plastics Refinishing (GENERAL PROCEDURES, Body Repairs)

Plastics Repair (GENERAL PROCEDURES, Body Repairs)

Plenum Chamber (REMOVAL AND INSTALLATION, Climate Control)

Positive Crankcase Ventilation (PCV) Valve (REMOVAL AND INSTALLATION, Engine Emission Control)

Power Brake Actuation (Section Table of Contents)

Power Brake Actuation (SPECIFICATIONS)

Power Brake System (DIAGNOSIS AND TESTING, Power Brake Actuation)

Power Steering (DESCRIPTION AND OPERATION)

Power Steering (DIAGNOSIS AND TESTING)

Power Steering (Section Table of Contents)

Power Steering (SPECIFICATIONS)

Power Steering Fluid Cooler (REMOVAL AND INSTALLATION, Power Steering)

Power Steering Fluid Reservoir (REMOVAL AND INSTALLATION, Power Steering)

Power Steering Pump (REMOVAL AND INSTALLATION, Power Steering)

Power Steering Pump Pulley (REMOVAL AND INSTALLATION, Power Steering)

Power Steering Pump to Steering Gear Pressure Line (REMOVAL AND INSTALLATION, Power Steering)

Power Steering System Filling (GENERAL PROCEDURES, Steering System)

Power Steering System Flushing (GENERAL PROCEDURES, Steering System)

Power Steering System Purging (GENERAL PROCEDURES, Steering System)

Powertrain Control Module (PCM) (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Powertrain/Drivetrain Mount Neutralizing (GENERAL PROCEDURES, Engine System - General Information)

Preliminary Inspection (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Principles of Operation (DIAGNOSIS AND TESTING, Battery, Mounting and Cables)

Principles of Operation (DIAGNOSIS AND TESTING, Brake System - General Information)

Principles of Operation (DIAGNOSIS AND TESTING, Charging System)

Principles of Operation (DIAGNOSIS AND TESTING, Hydraulic Brake Actuation)

Programmable Module Installation (PMI) (GENERAL PROCEDURES, Module Configuration)

Public Safety - Police Package (DIAGNOSIS AND TESTING, Exterior Lighting)

Pump and Intermediate Clutch Piston (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Pyrotechnic Device Disposal (GENERAL PROCEDURES, Supplemental Restraint System)

## **Q**

Quarter Panel Moulding (REMOVAL AND INSTALLATION, Exterior Trim and Ornamentation)

Quarter Trim Panel (REMOVAL AND INSTALLATION, Interior Trim and Ornamentation)

Quick Connect Coupling (GENERAL PROCEDURES, Fuel System - General Information)

## **R**

Radiator (REMOVAL AND INSTALLATION, Engine Cooling)

Radiator Grille Opening Panel (REMOVAL AND INSTALLATION, Front End Body Panels)

Range Selection (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Rear Disc Brake (DESCRIPTION AND OPERATION)

Rear Disc Brake (DIAGNOSIS AND TESTING)

Rear Disc Brake (Section Table of Contents)

Rear Disc Brake (SPECIFICATIONS)

Rear Door Handles, Locks and Latches - Exploded View (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Rear Door Latch (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Rear Door Lock Actuator (REMOVAL AND INSTALLATION, Handles, Locks, Latches and Entry Systems)

Rear Drive Axle and Differential (DESCRIPTION AND OPERATION, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Rear Drive Axle and Differential (DIAGNOSIS AND TESTING, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear (Section Table of Contents)

Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear (SPECIFICATIONS)

Rear Lamp Assembly (REMOVAL AND INSTALLATION, Exterior Lighting)

Rear Suspension (DESCRIPTION AND OPERATION)

Rear Suspension (DIAGNOSIS AND TESTING)

Rear Suspension (Section Table of Contents)

Rear Suspension (SPECIFICATIONS)

Rear View Mirrors (DESCRIPTION AND OPERATION)

Rear View Mirrors (Section Table of Contents)

Rear View Mirrors (SPECIFICATIONS)

Rear View Mirrors - Exterior (DIAGNOSIS AND TESTING, Rear View Mirrors)

Rear View Mirrors - Interior (DIAGNOSIS AND TESTING, Rear View Mirrors)

Rear Wheel Bearing and Axle Shaft Seal (IN-VEHICLE REPAIR, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Refinishing - Environmental Damage (GENERAL PROCEDURES, Body Repairs)

Refinishing - Manufacturing Damage (GENERAL PROCEDURES, Body Repairs)

Refrigerant Identification Testing (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Refrigerant Oil Adding (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Refrigerant System Filtering Following Air Conditioning (A/C) Compressor Installation (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Refrigerant System Tests (GENERAL PROCEDURES, Climate Control System - General Information and

Diagnostics)

Register - Driver Side and Center (REMOVAL AND INSTALLATION, Climate Control)

Register - Passenger Side (REMOVAL AND INSTALLATION, Climate Control)

Remote Keyless Entry (RKE) Transmitter Programming (GENERAL PROCEDURES, Handles, Locks, Latches and Entry Systems)

Restoring Corrosion Protection Following Repair (GENERAL PROCEDURES, Body Repairs)

Restraints Control Module (RCM) (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Reverse Clutch (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Reverse Servo Assembly (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Reverse Sun Gear (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Reversing Lamps (DIAGNOSIS AND TESTING, Exterior Lighting)

Ride Height Adjustments (GENERAL PROCEDURES, Vehicle Dynamic Suspension)

Ride Height Measurement (GENERAL PROCEDURES, Suspension System - General Information)

Ring Gear Backlash Adjustment (GENERAL PROCEDURES, Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear)

Roller Follower Inspection (GENERAL PROCEDURES, Engine System - General Information)

## **S**

Safety Belt Buckle - Front (REMOVAL AND INSTALLATION, Safety Belt System)

Safety Belt Buckle - Front, Center (REMOVAL AND INSTALLATION, Safety Belt System)

Safety Belt Buckle - Rear (REMOVAL AND INSTALLATION, Safety Belt System)

Safety Belt Cleaning (GENERAL PROCEDURES, Safety Belt System)

Safety Belt Maintenance (GENERAL PROCEDURES, Safety Belt System)

Safety Belt Procedure After a Collision (GENERAL PROCEDURES, Safety Belt System)

Safety Belt Retractor and Pretensioner (REMOVAL AND INSTALLATION, Safety Belt System)

Safety Belt Retractor - Rear (REMOVAL AND INSTALLATION, Safety Belt System)

Safety Belt Retractor - Rear, Center (REMOVAL AND INSTALLATION, Safety Belt System)



[Safety Belt Shoulder Height Adjuster \(REMOVAL AND INSTALLATION, Safety Belt System\)](#)

[Safety Belt System \(DESCRIPTION AND OPERATION\)](#)

[Safety Belt System \(DIAGNOSIS AND TESTING\)](#)

[Safety Belt System \(Section Table of Contents\)](#)

[Safety Belt System \(SPECIFICATIONS\)](#)

[Safety Belt Tongue Rotated on Belt \(GENERAL PROCEDURES, Safety Belt System\)](#)

[Safety Belt Twisted at the Safety Belt Guide \(GENERAL PROCEDURES, Safety Belt System\)](#)

[Sealers \(DESCRIPTION AND OPERATION, Body Repairs\)](#)

[Seals, Rings and Gasket Locator \(DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E\)](#)

[Seat Armrest - Rear \(DISASSEMBLY AND ASSEMBLY, Seating\)](#)

[Seat Armrest - Rear \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat Backrest - Front \(DISASSEMBLY AND ASSEMBLY, Seating\)](#)

[Seat Backrest - Front \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat Control Switch \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat Cushion - Front \(DISASSEMBLY AND ASSEMBLY, Seating\)](#)

[Seat Position Sensor \(REMOVAL AND INSTALLATION, Supplemental Restraint System\)](#)

[Seat Recliner - Manual \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat Recliner - Power \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat Track \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat - Exploded View, Front \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat - Front \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seat - Rear \(REMOVAL AND INSTALLATION, Seating\)](#)

[Seating \(Section Table of Contents\)](#)

[Seating \(SPECIFICATIONS\)](#)

[Seats \(DESCRIPTION AND OPERATION, Seating\)](#)

[Seats \(DIAGNOSIS AND TESTING, Seating\)](#)

[Sectioning Guidelines \(GENERAL PROCEDURES, Body Repairs\)](#)

Selector Lever (REMOVAL AND INSTALLATION, Automatic Transaxle/Transmission External Controls)

Selector Lever Cable Adjustment (GENERAL PROCEDURES, Automatic Transaxle/Transmission External Controls)

Selector Lever Cable and Bracket (REMOVAL AND INSTALLATION, Automatic Transaxle/Transmission External Controls)

Selector Lever Indicator Adjustment (GENERAL PROCEDURES, Automatic Transaxle/Transmission External Controls)

Shift Patterns (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Shift Point Road Test (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Shock Absorber (REMOVAL AND INSTALLATION, Rear Suspension)

Shock Absorber and Spring Assembly (DISASSEMBLY AND ASSEMBLY, Front Suspension)

Shock Absorber and Spring Assembly (REMOVAL AND INSTALLATION, Front Suspension)

Side Air Bag Module (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Side Impact Sensor (REMOVAL AND INSTALLATION, Supplemental Restraint System)

Side Turn Signal Lamp (REMOVAL AND INSTALLATION, Exterior Lighting)

Sound Deadeners and Insulators (DESCRIPTION AND OPERATION, Body Repairs)

Spare Key Programming - Unlimited Key Mode (GENERAL PROCEDURES, Anti-Theft - Passive Anti-Theft System (PATS))

Spare Key Programming - Using Diagnostic Equipment (GENERAL PROCEDURES, Anti-Theft - Passive Anti-Theft System (PATS))

Spark Plug Inspection (GENERAL PROCEDURES, Engine System - General Information)

Spark Plugs (REMOVAL AND INSTALLATION, Engine Ignition - 4.6L (2V))

Speaker - Subwoofer (REMOVAL AND INSTALLATION, Information and Entertainment Systems)

Special Testing Procedures (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Spotlamp (REMOVAL AND INSTALLATION, Exterior Lighting)

Spring Lock Coupling (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Spring Lock Couplings (GENERAL PROCEDURES, Fuel System - General Information)

Spring - Coil (REMOVAL AND INSTALLATION, Rear Suspension)

Sprockets (GENERAL PROCEDURES, Engine System - General Information)

Stability/Traction Control Switch (REMOVAL AND INSTALLATION, Vehicle Dynamic Systems)

Stabilizer Bar (REMOVAL AND INSTALLATION, Front Suspension)

Stabilizer Bar and Link (REMOVAL AND INSTALLATION, Rear Suspension)

Stabilizer Bar Link (REMOVAL AND INSTALLATION, Front Suspension)

Starter Motor (REMOVAL AND INSTALLATION, Starting System)

Starter Motor Drive Gear and Flywheel Ring Gear Inspection (GENERAL PROCEDURES, Starting System)

Starter Motor Solenoid Relay - ISO Mini (REMOVAL AND INSTALLATION, Starting System)

Starting System (DESCRIPTION AND OPERATION)

Starting System (DIAGNOSIS AND TESTING)

Starting System (Section Table of Contents)

Starting System (SPECIFICATIONS)

Steering Column (DESCRIPTION AND OPERATION)

Steering Column (DIAGNOSIS AND TESTING)

Steering Column (DISASSEMBLY AND ASSEMBLY)

Steering Column (REMOVAL AND INSTALLATION)

Steering Column (Section Table of Contents)

Steering Column (SPECIFICATIONS)

Steering Column Multifunction Switch (REMOVAL AND INSTALLATION, Steering Column Switches)

Steering Column Shaft (REMOVAL AND INSTALLATION, Steering Column)

Steering Column Shroud (REMOVAL AND INSTALLATION, Steering Column)

Steering Column Switches (DESCRIPTION AND OPERATION)

Steering Column Switches (DIAGNOSIS AND TESTING)

Steering Column Switches (Section Table of Contents)

Steering Column Switches (SPECIFICATIONS)

Steering Gear (REMOVAL AND INSTALLATION, Power Steering)

Steering Gear Turn Tubes (REMOVAL AND INSTALLATION, Power Steering)

Steering System (DESCRIPTION AND OPERATION)

Steering System (DIAGNOSIS AND TESTING)

Steering System (Section Table of Contents)

Steering System (SPECIFICATIONS)

Steering Wheel (REMOVAL AND INSTALLATION, Steering Column)

Steering Wheel Controls (REMOVAL AND INSTALLATION, Information and Entertainment Systems)

Steering Wheel Wrap Bonding (GENERAL PROCEDURES, Steering Column)

Stoplamp Switch (REMOVAL AND INSTALLATION, Exterior Lighting)

Stoplamps (DIAGNOSIS AND TESTING, Exterior Lighting)

Striker Adjustment (GENERAL PROCEDURES, Body Closures)

Subwoofer Amplifier (REMOVAL AND INSTALLATION, Information and Entertainment Systems)

Suction Accumulator (REMOVAL AND INSTALLATION, Climate Control)

Suction Accumulator to Compressor Line (REMOVAL AND INSTALLATION, Climate Control)

Suction Accumulator To Evaporator Line (REMOVAL AND INSTALLATION, Climate Control)

Supplemental Restraint System (Section Table of Contents)

Supplemental Restraint System (SPECIFICATIONS)

Supplemental Restraint System (SRS) Deactivation and Reactivation (GENERAL PROCEDURES, Supplemental Restraint System)

Supplemental Restraint System (SRS) Depowering and Repowering (GENERAL PROCEDURES, Supplemental Restraint System)

Suspension Height Sensor (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Suspension System (DIAGNOSIS AND TESTING, Suspension System - General Information)

Suspension System - General Information (Section Table of Contents)

Suspension System - General Information (SPECIFICATIONS)

Symptom Chart (DIAGNOSIS AND TESTING, Brake System - General Information)

Symptom Chart (DIAGNOSIS AND TESTING, Charging System)

Symptom Chart (DIAGNOSIS AND TESTING, Hydraulic Brake Actuation)

## T

Temperature Blend Door Actuator (REMOVAL AND INSTALLATION, Climate Control)

Temperature Control Switch (REMOVAL AND INSTALLATION, Climate Control)

Thermostat (REMOVAL AND INSTALLATION, Engine Cooling)

Throttle Body (REMOVAL AND INSTALLATION, Fuel Charging and Controls - 4.6L (2V))

Throttle Body - Spacer (REMOVAL AND INSTALLATION, Fuel Charging and Controls - 4.6L (2V))

Throttle Position (TP) Sensor (REMOVAL AND INSTALLATION, Electronic Engine Controls)

Timing Drive Components (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Tire Pressure Monitoring System (DIAGNOSIS AND TESTING, Wheels and Tires)

Tire Pressure Monitoring System (TPMS) Sensor (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Wheels and Tires)

Tire Pressure Monitoring System (TPMS) Sensor Activation (GENERAL PROCEDURES, Wheels and Tires)

Tire Pressure Monitoring System (TPMS) Sensor Training (GENERAL PROCEDURES, Wheels and Tires)

Tire Pressure Monitoring System (TPMS) Strap and Cradle (DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES, Wheels and Tires)

Toe Adjustment (GENERAL PROCEDURES, Suspension System - General Information)

Torque Converter (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Torque Converter Contamination Inspection (GENERAL PROCEDURES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Torque Converter Diagnosis (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Torsion Bar Loading (GENERAL PROCEDURES, Body Closures)

Transaxle/Transmission Cooling (Section Table of Contents)

Transaxle/Transmission Cooling (SPECIFICATIONS)

Transmission (ASSEMBLY, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission (DISASSEMBLY, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission (INSTALLATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission (REMOVAL, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Connector Layouts (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Cooling (DESCRIPTION AND OPERATION, Transaxle/Transmission Cooling)

Transmission Cooling (DIAGNOSIS AND TESTING, Transaxle/Transmission Cooling)

Transmission Description (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Drive Cycle Test (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Electronic Control System (DESCRIPTION AND OPERATION, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Filler Tube (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Fluid Cooler (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Fluid Cooler (REMOVAL AND INSTALLATION, Transaxle/Transmission Cooling)

Transmission Fluid Cooler Backflushing and Cleaning (GENERAL PROCEDURES, Transaxle/Transmission Cooling)

Transmission Fluid Cooler Tubes (REMOVAL AND INSTALLATION, Transaxle/Transmission Cooling)

Transmission Fluid Cooler Tubes Backflushing and Cleaning (GENERAL PROCEDURES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Fluid Drain and Refill (GENERAL PROCEDURES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Fluid Exchange (GENERAL PROCEDURES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Insulator and Retainer (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Range (TR) Sensor Adjustment (GENERAL PROCEDURES, Automatic Transaxle/Transmission - 4R70E/4R75E)

Transmission Support Crossmember (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Turbine Shaft Speed (TSS) Sensor (IN-VEHICLE REPAIR, Automatic Transaxle/Transmission - 4R70E/4R75E)

Turn Signal, Cornering and Hazard Lamps (DIAGNOSIS AND TESTING, Exterior Lighting)

## U

Universal Joints (DESCRIPTION AND OPERATION, Driveshaft)

Upper Arm (REMOVAL AND INSTALLATION, Front Suspension)

Upper Arm (REMOVAL AND INSTALLATION, Rear Suspension)

## V

Vacuum Control Motor - Air Inlet Door (REMOVAL AND INSTALLATION, Climate Control)

Vacuum Control Motor - Floor Defrost Door (REMOVAL AND INSTALLATION, Climate Control)

Vacuum Control Motor - Panel Door (REMOVAL AND INSTALLATION, Climate Control)

Vacuum Hose Repair - Mini-Tube (GENERAL PROCEDURES, Climate Control System - General Information and Diagnostics)

Vacuum Reservoir (REMOVAL AND INSTALLATION, Climate Control)

Valve Cover - LH (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Valve Cover - RH (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Valve Guide Inner Diameter (GENERAL PROCEDURES, Engine System - General Information)

Valve Inspection (GENERAL PROCEDURES, Engine System - General Information)

Valve Seals (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Valve Seat Inspection (GENERAL PROCEDURES, Engine System - General Information)

Valve Seat Runout (GENERAL PROCEDURES, Engine System - General Information)

Valve Seat Width (GENERAL PROCEDURES, Engine System - General Information)

Valve Spring Free Length (GENERAL PROCEDURES, Engine System - General Information)

Valve Spring Installed Length (GENERAL PROCEDURES, Engine System - General Information)

Valve Spring Squareness (GENERAL PROCEDURES, Engine System - General Information)

Valve Spring Strength (GENERAL PROCEDURES, Engine System - General Information)

Valve Springs (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Valve Stem Diameter (GENERAL PROCEDURES, Engine System - General Information)

Valve Stem to Valve Guide Clearance (GENERAL PROCEDURES, Engine System - General Information)

Valve Train Components - Exploded View (IN-VEHICLE REPAIR, Engine - 4.6L (2V))

Vehicle Dynamic Suspension (DESCRIPTION AND OPERATION)

Vehicle Dynamic Suspension (DIAGNOSIS AND TESTING)

Vehicle Dynamic Suspension (Section Table of Contents)

Vehicle Dynamic Suspension (SPECIFICATIONS)

Vehicle Dynamic Systems (Section Table of Contents)

Vehicle Dynamic Systems (SPECIFICATIONS)

Vehicle Dynamics Module (VDM) (REMOVAL AND INSTALLATION, Vehicle Dynamic Suspension)

Visual Inspection (DIAGNOSIS AND TESTING, Automatic Transaxle/Transmission - 4R70E/4R75E)

## **W**

Warning Chimes (DESCRIPTION AND OPERATION, Instrumentation, Message Center, and Warning Chimes)

Washer Pump and Reservoir (REMOVAL AND INSTALLATION, Wipers and Washers)

Weld-Bonding (GENERAL PROCEDURES, Body Repairs)

Welding Precautions - Steel (DESCRIPTION AND OPERATION, Body Repairs)

Wheel Alignment Angles (DESCRIPTION AND OPERATION, Suspension System - General Information)

Wheel and Tire (DISASSEMBLY AND ASSEMBLY, Wheels and Tires)

Wheel and Tire (REMOVAL AND INSTALLATION, Wheels and Tires)

Wheel Bearing and Wheel Hub (REMOVAL AND INSTALLATION, Front Suspension)

Wheel Knuckle (REMOVAL AND INSTALLATION, Front Suspension)

Wheel Speed Sensor - Front (REMOVAL AND INSTALLATION, Vehicle Dynamic Systems)

Wheel Speed Sensor - Rear (REMOVAL AND INSTALLATION, Vehicle Dynamic Systems)

Wheel Studs (REMOVAL AND INSTALLATION, Front Suspension)

Wheel Studs (REMOVAL AND INSTALLATION, Rear Suspension)

Wheels And Tires (DESCRIPTION AND OPERATION, Wheels and Tires)

Wheels And Tires (DIAGNOSIS AND TESTING, Wheels and Tires)

Wheels and Tires (Section Table of Contents)

Wheels and Tires (SPECIFICATIONS)

Window Control Switch (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Glass Adjustment (GENERAL PROCEDURES, Glass, Frames and Mechanisms)



Window Glass - Front Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Glass - Rear (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Glass - Rear Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Glass - Rear Quarter (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Grid Wire Repair (GENERAL PROCEDURES, Glass, Frames and Mechanisms)

Window Regulator and Motor - Front Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Regulator and Motor - Rear Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Regulator Motor - Front Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Window Regulator Motor - Rear Door (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Windshield Glass (REMOVAL AND INSTALLATION, Glass, Frames and Mechanisms)

Wiper and Washer System - Exploded View (REMOVAL AND INSTALLATION, Wipers and Washers)

Wiper Blade and Pivot Arm Adjustment (GENERAL PROCEDURES, Wipers and Washers)

Wiper Motor (REMOVAL AND INSTALLATION, Wipers and Washers)

Wiper Mounting Arm and Pivot Shaft (REMOVAL AND INSTALLATION, Wipers and Washers)

Wiper Pivot Arm (REMOVAL AND INSTALLATION, Wipers and Washers)

Wipers and Washers (DESCRIPTION AND OPERATION)

Wipers and Washers (DIAGNOSIS AND TESTING)

Wipers and Washers (Section Table of Contents)

Wipers and Washers (SPECIFICATIONS)

## Material

Item	Specification	Fill Capacity
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	-	-
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	0.94L (2.0 pt) <sup>a</sup>

<sup>a</sup> Capacities listed are average system capacities and may vary.

## General Specifications

Item	Specification
Power steering purge vacuum	68-85 kPa (20-25 in-Hg)
Turning effort	2.72 kg (6.0 lb)
<b>Power Steering Pump</b>	
Flow @ 2,100 rpm	10.6 ± 1.7L/minute (2.6 ± 0.4 gpm)  Fluid temperature 74-80°C (165-176°F)  Engine speed set to 2,100 rpm (with no steering input)  Power steering analyzer set @ 345 kPa (50 psi)
Flow @ idle (minimum flow)	5.7L/minute (1.5 gpm)  Fluid temperature 74-80°C (165-176°F)  Engine at idle  Pressure at 5,171 kPa (750 psi)
Pressure	1,034 kPa (150 psi)  Fluid temperature 74-80°C (165-176°F)  Engine speed set to 2,100 rpm (with no steering input)
Relief pressure	9,652-10,686 kPa (1,400-1,550 psi)



## Steering System

The power steering system consists of the following components:

- Power steering pump
- Power steering fluid reservoir
- Steering gear
- Power steering lines
- Steering column
- Steering column shaft
- Power steering cooler (if equipped)

The power steering system transfers driver inputs at the steering wheel to the front wheels of the vehicle. The steering column, hydraulic system and linkages that transfer these driver inputs make up the steering system. Gearing and hydraulic assist are used to significantly reduce steering efforts.






For information on the power steering fluid reservoir, power steering pump, power steering lines and steering gear, refer to Section 211-02 .

For information on the steering wheel, steering column and steering column shaft, refer to Section 211-04 .

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**Steering System**

## Special Tool(s)

	100W/12 Volt DC UV Lamp 164-R0751
	Dial Thermometer 0-220°F 023-R0007 or equivalent
	Evacuation Cap, Power Steering 211-265 or equivalent
	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent
	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

## Material

Item	Specification
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	-
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

**Principles of Operation****Power Steering**

The power steering system uses a vane-type pump to move the fluid from the reservoir to the steering gear and through the rest of the steering hydraulic system. The power steering pump is mounted to the engine and driven by the engine accessory drive belt. Power steering fluid flows into the pump from the reservoir. The power steering fluid is trapped between the pump vanes and moved to the high-pressure side of the pump creating a flow of fluid. The restriction of this flow by the steering gear creates the pressure that provides the steering assist. A combined pressure relief/flow valve is built into the pump to control the maximum pressure and flow provided to the steering system. This action prevents damage to the system and provides the correct level of assist during all engine speeds. While under pressure, the power steering fluid flows through the high-pressure power steering line to the steering gear. The fluid exits the gear and flows through the return line, cooler and finally to the reservoir. The reservoir slows the fluid, allows air to escape and filters the fluid before returning it to the pump.

## Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage.

## Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> <li>• Fluid level</li> <li>• Tire pressure</li> <li>• Tires</li> <li>• Drive belt</li> <li>• Drive belt tensioner</li> <li>• Steering column alignment</li> <li>• Tie-rod ends</li> <li>• Suspension components</li> <li>• Steering column shaft U-joints</li> <li>• Steering column shaft bolts</li> <li>• Power steering reservoir baffle</li> <li>• Power steering reservoir screen</li> <li>• Pressure lines, fittings or O-rings</li> <li>• Power steering return hoses and clamps</li> <li>• Steering gear</li> <li>• Power steering pump</li> <li>• Power Steering Pressure (PSP) switch</li> </ul>

3. Inspect the power steering fluid for the following conditions:
  - Aeration or foam: Purge the power steering system. Refer to Power Steering System Purging in this section.
  - Overheating or contamination: Flush the power steering system. Refer to Power Steering System Flushing in this section.

4. **NOTE:** It may be necessary to add power steering fluid to achieve the correct level.

Check the fluid level and clean the power steering components.  
With the ignition OFF:

- check the power steering fluid level and add fluid as necessary.
- wipe off any visible signs of fluid or residue build up.
- **NOTICE:** Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.

Start the engine and turn the steering wheel from stop-to-stop several times.

5. Visually inspect the power steering hydraulic line/hose connections for leaks.

- If a leak is detected at a threaded fitting or clamp plate joint, tighten to specification. If the leak is still evident, visually inspect the O-rings or Teflon® seals. Install new O-rings or Teflon® seals as necessary. Refer to [Section 211-02](#).
- If a leak is detected at a constant tension spring clamp, verify that the hose is not damaged and fully installed on the hose fitting. Make sure that the constant tension spring clamp is positioned 2 mm (0.078 in) from the end of the hose. If the leak remains, install a new constant tension spring clamp.
- If a leak is detected at a screw clamp joint, verify that the hose is fully installed on the hose fitting and the clamp is positioned 2 mm (0.078 in) from the end of the hose before tightening the screw clamp. If the leak remains, install a new screw clamp. Refer to [Section 211-02](#).
- If a leak is detected at the Power Steering Pressure (PSP) switch, install a new switch as necessary.

6. Visually inspect the power steering components for leaks.

- If a leak is detected in the pressure line or return hose, install a new hose. Refer to [Section 211-02](#).
- If a leak is detected in the power steering pump, install a new power steering pump. Refer to [Section 211-02](#).
- **NOTE:** On vehicles with rack-and-pinion steering gear, it may be necessary to remove the bellows boot clamp from the steering gear bellows boot to inspect for internal steering gear leaks.

If a leak is detected in the steering gear, repair or install a new steering gear. Refer to [Section 211-02](#).

- If a leak is detected in the power steering reservoir, install a new reservoir. Refer to [Section 211-02](#).

7. For information on power steering leak detection, refer to Component Tests in this section.

8. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding.

9. If the cause is not visually evident, verify the symptom and GO to [Symptom Chart - Steering System](#) or GO to [Symptom Chart - NVH](#).

## Steering System Symptom Definitions

### Drift/Pull

Pull is described as a tugging sensation felt by the hands on the steering wheel that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with the hands off the steering wheel.

- A vehicle-related drift/pull on a flat road can cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull can be induced by conditions external to the vehicle, such as wind or road camber.

### Excessive Steering Wheel Play

Excessive steering wheel play is a condition in which there is too much steering wheel movement before the wheels move. A small amount of steering wheel free play is considered normal.

### Lack of Assist or Inconsistent Assist

Lack of assist or inconsistent assist is experienced when the steering wheel effort is higher than normal. Hard steering can remain constant through the full turn or occur near the end of a turn. It is important to know the difference between hard steering/lack of assist and poor returnability/sticky steering.

Hard steering or lack of assist can result from either hydraulic or mechanical conditions. It is extremely important to know if this concern occurs during driving or during high-effort parking maneuvers.

### Poor Returnability/Sticky Steering

Poor returnability and sticky steering is used to describe the poor return of the steering wheel to center after a turn or steering correction is completed.

### Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel corrections to maintain a straight path down a level road.

## Symptom Chart - Steering System

Symptom Chart - Steering System

### Symptom Chart - NVH

Symptom Chart - NVH

**NOTE:** NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

#### ConditionPossible SourcesAction

- Steering system cold start noise
- Blockage in the power steering fluid reservoir caused by power steering fluid contamination
- **NOTE:** Some noise during an extremely cold start (-12.2°C [-10°F]) is normal and should improve as the steering system warms up (usually within 60 seconds).
- **NOTE:** It may be necessary to remove the power steering fluid reservoir to flush contamination trapped in the reservoir screen.

CHECK the power steering fluid reservoir for contamination. FLUSH the power steering system as necessary. REFER to Power Steering System Flushing in this section.

- Air in the steering hydraulic system (aerated fluid)
- CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section.



- Steering grunt or shudder - occurs when turning into or out of a turn at low speeds (temperature sensitive)
- Air in the steering hydraulic system (aerated fluid)
- CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section.
- Steering gear or power steering hoses
- GO to Steering Gear Grunt/Shudder Component Test in this section.
- Steering system clonk - hydraulic knocking sound
- Air in the steering hydraulic system (aerated fluid)
- **NOTE:** Some amount of clonk noise is considered acceptable. If in doubt of the acceptability, compare to another vehicle.

CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section.

- Power steering pump moan - loud humming noise occurs when the steering wheel is rotated to the stop position. Produces a 120-600 Hz frequency that changes with rpm
- Low fluid and/or air in the steering hydraulic system (aerated fluid)
- CHECK for leaks in the system. REFER to Power Steering Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section. If a pump moan still exists, INSTALL a new power steering pump. REFER to Section 211-02 .
- Power steering fluid reservoir or screen is blocked or damaged
- INSPECT the reservoir. FLUSH or INSTALL a new reservoir as necessary.
- Power steering line/hose grounded to chassis
- INSPECT the power steering lines/hoses. REPAIR as necessary.
- Power steering pump brackets loose or misaligned
- CHECK bolts, brackets and bracket alignment. TIGHTEN bolts to specification. REPAIR or INSTALL new brackets as necessary. REFER to Section 211-02 .
- Steering gear isolators
- INSPECT the isolators for wear or damage. REPAIR as necessary.
- Steering gear clunk - occurs only while cornering over a bump (can be temperature sensitive)
- Steering gear
- INSPECT the steering gear for loose mounting bolts. TIGHTEN to specification as necessary. REFER to Section 211-02 .

- Feedback (rattle, chuckle or knocking noise in the steering gear) - roughness is felt in the steering wheel when the vehicle is driven over rough surfaces
- Steering column shaft/U-joints damaged or worn
- INSTALL a new steering column shaft. REFER to Section 211-04 .
- Loose, damaged or worn tie-rod ends
- INSPECT and INSTALL new tie-rod ends as necessary. GO to Steering Linkage Component Test in this section.
- Steering gear insulators or mounting bolts loose or damaged
- TIGHTEN the bolts to specification or INSTALL new bolts as necessary. REFER to Section 211-02 .
- Steering column shaft bolts are loose
- TIGHTEN the bolts to specification. REFER to Section 211-04 .
- Steering column damaged or worn
- REPAIR or INSTALL a new steering column as necessary. REFER to Section 211-04 .
- Power steering hiss or whistle
- Steering column shaft-to-steering gear is binding or misaligned
- REPAIR or INSTALL a new steering column shaft as necessary. REFER to Section 211-04 .
- Grounded or loose steering column boot at the dash panel
- REPAIR as necessary.
- Damaged or worn steering gear input shaft and valve
- REPAIR or INSTALL a new steering gear as necessary. REFER to Section 211-02 .
- Restricted power steering lines/hoses
- INSTALL new power steering lines/hoses as necessary. REFER to Section 211-02 .
- Steering column rattle
- Loose bolts or attaching brackets
- TIGHTEN the bolts to specification.
- Loose, worn or insufficiently lubricated column bearings
- LUBRICATE bearings or INSTALL new steering column bearings or steering column as necessary. REFER to Section 211-04 .
- Steering shaft insulators damaged or worn

- INSTALL new insulators. REFER to Section 211-04 .
- Steering column shaft compressed or extended
- INSPECT the rubber spider coupling for damage. INSTALL a new steering column shaft. REFER to Section 211-04 .
- Steering gear squeak
- Incorrect power steering fluid in system
- If incorrect power steering fluid is suspected, FLUSH the power steering system. REFER to Power Steering System Flushing in this section. If noise persists after system flush, INSTALL a new steering gear. REFER to Section 211-02 .
- Steering gear rotary seal
- **NOTE:** VERIFY that the steering gear is the source of the noise. It may be necessary to replicate the customer operating conditions (fluid temperature, turning rate of steering wheel) to get the squeak to reoccur.

INSTALL a new steering gear as necessary. REFER to Section 211-02 .

- Stone shield (if equipped)
- MAKE SURE that the stone shield is correctly installed and that it is not making contact with the steering shaft. REPOSITION stone shield or INSTALL a new stone shield as necessary.
- Steering column squeak, cracks or grinds
- Insufficiently lubricated steering shaft bushings
- LUBRICATE the steering shaft and shaft tube seals.
- Loose or misaligned steering column shrouds
- TIGHTEN or ALIGN the steering column shrouds.
- Steering wheel rubbing against steering column shrouds
- REPOSITION the steering column shrouds.
- Upper or lower bearing sleeves out of position
- REPOSITION the bearing sleeves.
- Power steering pump noisy
- Power steering pump
- INSTALL a new power steering pump as necessary. REFER to Section 211-02 .
- Power steering pump relief noise

- Power steering fluid flow into the bypass valve of the pump valve housing, with fluid temperature below 54°C (130°F)
- Acceptable condition.
- Power steering pump whine noise
- Aerated fluid
- CHECK for a leak in the system. REFER to Power Steering Fluid Leak Test Component Test. PURGE the air from the system. REFER to Power Steering System Purging in this section.
- Damaged power steering pump
- INSTALL a new power steering pump as necessary. REFER to Section 211-02 .
- High speed shake or shimmy - occurs at high speeds
- Worn or damaged steering linkage components
- GO to Steering Linkage Component Test in this section.

## Pinpoint Tests

### Pinpoint Test A: Steering Has Lack of Assist or Inconsistent Assist

**NOTE:** Hard steering or lack of assist is experienced when the steering wheel effort exceeds specifications. Hard steering can remain constant through the full turn, occur near the end of a turn or differ right to left. It is important to know the difference between hard steering/lack of assist and poor returnability/sticky steering.

**This pinpoint test is intended to diagnose the following:**

- Power steering fluid contamination
- Steering gear
- Power steering pump
- Power steering hoses

#### PINPOINT TEST A: STEERING HAS LACK OF ASSIST OR INCONSISTENT ASSIST

Test Step	Result / Action to Take
<b>A1 CHECK FOR POWER STEERING FLUID CONTAMINATION</b>	
<ul style="list-style-type: none"> <li>• Check the power steering fluid for contamination.</li> <li>• <b>Is the power steering fluid contaminated?</b></li> </ul>	<p><b>Yes</b> FLUSH the power steering system. REFER to <u>Power Steering System Flushing</u> in this section. CHECK the system for normal operation. If assist concern still exists, GO to <u>A2</u> .</p> <p><b>No</b> GO to <u>A2</u> .</p>

<b>A2 CHECK THE STEERING ASSIST WITH THE ENGINE RPM RAISED</b>	
<ul style="list-style-type: none"> <li>• <b>NOTICE:</b> Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.</li> <li>• Set the engine at 2,100 rpm and turn the steering wheel fully to the left and right.</li> <li>• Is steering assist normal with the engine rpm raised?</li> </ul>	<p><b>Yes</b> INSTALL a new power steering pump. REFER to <u>Section 211-02</u> .</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 CHECK FOR A CHANGE OF ASSIST ON LEFT AND RIGHT TURNS</b>	
<ul style="list-style-type: none"> <li>• With the engine at idle, turn the steering wheel fully to the left and to the right.</li> <li>• Does the steering assist change when turning from right to left?</li> </ul>	<p><b>Yes</b> INSTALL a new steering gear. REFER to <u>Section 211-02</u> .</p> <p><b>No</b> GO to <u>A4</u> .</p>
<b>A4 CHECK THE STEERING LINES AND HOSES FOR RESTRICTIONS</b>	
<ul style="list-style-type: none"> <li>• Inspect the steering lines and hoses for damage, kinks or restrictions.</li> <li>• Are the steering lines or hoses damaged, kinked or restricted?</li> </ul>	<p><b>Yes</b> INSTALL new lines or hoses as necessary.</p> <p><b>No</b> GO to <u>A5</u> .</p>
<b>A5 MONITOR THE ENGINE RPM CHANGES</b>	
<p><b>NOTICE:</b> Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.</p> <p><b>NOTE:</b> Make sure that the vehicle is on a flat dry surface, all accessories are in the OFF position and that the steering system is at normal operating temperature.</p> <ul style="list-style-type: none"> <li>• Connect the scan tool.</li> <li>• Start the engine.</li> <li>• With the engine at idle, raise the power steering fluid temperature to 74-80°C (165-176°F) by rotating the steering wheel fully to the left and right several times.</li> <li>• While monitoring the Engine Revolutions Per Minute (RPM) PID with the scan tool, turn the steering wheel quickly to the left stop position and then to the right stop position.</li> <li>• Note the engine rpm during the turns.</li> <li>• Does the engine rpm change (even temporarily) more than 30 rpm when turning the steering wheel?</li> </ul>	<p><b>Yes</b> INSTALL a new steering gear. REFER to <u>Section 211-02</u> .</p> <p><b>No</b> INSTALL a new power steering pump. REFER to <u>Section 211-02</u> .</p>

**Pinpoint Test B: Excessive Steering Wheel Play**

**This pinpoint test is intended to diagnose the following:**

- Steering linkage
- Steering column shaft U-joints
- Steering gear

**PINPOINT TEST B: EXCESSIVE STEERING WHEEL PLAY**

Test Step	Result / Action to Take
<b>B1 CHECK THE STEERING LINKAGE</b>	
<ul style="list-style-type: none"> <li>• Carry out the Steering Linkage Component Test in this section.</li> <li>• <b>Is the steering linkage OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> INSTALL new steering linkage components as necessary. Refer to the appropriate section in Group <u>211</u> for the procedure.</p>
<b>B2 CHECK THE STEERING COLUMN SHAFT</b>	
<ul style="list-style-type: none"> <li>• Inspect the steering column shaft U-joints and fasteners for looseness.</li> <li>• <b>Are the U-joints and fasteners OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new steering gear as necessary. REFER to <u>Section 211-02</u> .</p> <p><b>No</b> TIGHTEN the steering column shaft fasteners or INSTALL a new steering column shaft. REFER to <u>Section 211-04</u> .</p>

**Pinpoint Test C: Steering System Drift/Pull/Wander**

**This pinpoint test is intended to diagnose the following:**

- Steering gear
- Steering column shaft
- Steering column shaft U-joints
- Steering gear mounts

**PINPOINT TEST C: STEERING SYSTEM DRIFT/PULL/WANDER**

Test Step	Result / Action to Take
<b>C1 CHECK THE STEERING COLUMN SHAFT</b>	
<p><b>NOTE:</b> Be sure to keep the clockspring centered when disconnecting the intermediate shaft. Refer to the appropriate section in Group <u>501</u> for the procedure.</p> <ul style="list-style-type: none"> <li>• Check the steering column and shaft for grounding.</li> <li>• Disconnect the steering column shaft at the steering column.</li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> INSTALL a new steering column shaft as necessary. REFER to <u>Section 211-04</u> .</p>

<ul style="list-style-type: none"> <li>• Inspect the steering column shaft U-joints for looseness or wear.</li> <li>• <b>Are the steering column shaft U-joints OK?</b></li> </ul>	
<b>C2 CHECK THE STEERING GEAR MOUNTING</b>	
<ul style="list-style-type: none"> <li>• Check the steering gear mounts for looseness or wear.</li> <li>• <b>Are the steering gear mounts OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> INSTALL a new steering gear as necessary. REFER to <u>Section 211-02</u> .</p>
<b>C3 CHECK THE STEERING GEAR</b>	
<ul style="list-style-type: none"> <li>• Carry out the Steering Gear Valve Component Test in this section.</li> <li>• <b>Is the steering gear valve OK?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 204-00</u> to diagnose suspension system drift/pull/wander.</p> <p><b>No</b> REPAIR or INSTALL a new steering gear as necessary. REFER to <u>Section 211-02</u> .</p>

## Component Tests

### Power Steering Fluid Leak Test

**NOTE:** This test should only be carried out if a leak in the system has not been detected during a thorough visual inspection. Refer to Inspection and Verification in this section.

1. Remove the power steering pump reservoir cap and check the power steering fluid level. If necessary, add the specified power steering fluid.
2. Tightly install the Power Steering Evacuation Cap onto the reservoir and connect the Vacuum Pump Kit to the Evacuation Cap.
3. Using the Vacuum Pump Kit, apply 68-85 kPa (20-25 in-Hg) of vacuum to the power steering system.
4. Observe the vacuum gauge for 30 seconds. If the vacuum gauge reading drops more than 3 kPa (0.88 in-Hg), a leak is present.
5. Remove the Vacuum Pump Kit.
6. Start the engine and insert the Dial Thermometer into the Evacuation Cap.
7. **NOTICE: Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.**

With the engine at idle, raise the power steering fluid temperature to 74-80°C (165-176°F) by rotating the steering wheel fully to the left and right several times.

8. Stop the engine and visually inspect the system for leaks.
  - If a leak is evident, repair as necessary.
  - If a leak is not evident, add the specified UV fluorescent tracer dye to the power steering fluid. Use 14.78 ml (1/2 oz) of dye solution for every 1.89L (2 qt) of power steering fluid.

9. Start the engine.
10. **NOTICE: Do not hold the steering wheel at the stops for an extended amount of time. Damage to the power steering pump may occur.**

With the engine at idle, raise the power steering fluid temperature to 74-80°C (165-176°F) by rotating the steering wheel fully to the left and right several times.

11. Stop the engine and inspect the system for traces of UV dye using the 100W/12 Volt DC UV Lamp. Repair as necessary.

### Steering Gear Valve Test

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

If equipped with a fire suppression system, depower the system.

2. With the vehicle in NEUTRAL, position it on a hoist. Refer to Section 100-02A .
  - Raise the vehicle until the front wheels are off the ground.

3. **NOTE:** Do not hold the steering wheel while carrying out this step.

Start the engine.

- If the steering wheel rotates in either direction (with no hand input), install a new steering gear. Refer to Section 211-02 .

4. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

### Steering Gear Grunt/Shudder Test

1. Start and run the vehicle to operating temperature.
2. Set engine idle speed to 1,200 rpm.
3. **NOTICE: Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.**

Rotate the steering wheel to the RH stop, then turn the steering wheel 90 degrees back from that position. Slowly turn the steering wheel back and forth approximately one-twelfth of a full turn.

4. Turn the steering wheel another 90 degrees. Slowly turn the steering wheel back and forth approximately one-twelfth of a full turn.
5. Repeat the test with the power steering fluid at different temperatures.



6. If a light grunt is heard or a low (50-200 Hz) shudder is present, this is a normal steering system condition.
7. If a loud grunt is heard or a strong shudder is felt, purge the power steering system. Refer to Power Steering System Purging in this section. If a loud grunt or strong shudder still exists, check the power steering lines/hoses for restrictions or damage and repair as necessary. Refer to Section 211-02 . If the lines/hoses are OK, install a new steering gear. Refer to Section 211-02 .

### Steering Linkage Test

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

If equipped with a fire suppression system, depower the system.

2. **NOTE:** Excessive vertical motion of the studs relative to the sockets may indicate excessive wear.

With the vehicle on the ground and the parking brake applied, start the vehicle and carry out the following:

- Have an assistant rotate the steering wheel back and forth 360 degrees and watch for relative motion of the studs in the steering linkage ball sockets.
  - Watch for loose steering gear mounting.
3. As an additional check, with the Key ON Engine OFF (KOEO) and the front wheels raised off the ground, grasp the wheel at the front and rear and watch for excessive play or binding in the joints while trying to steer the wheels.
  4. Install new components if necessary. Tighten any worn, damaged or loose components. Refer to the appropriate section in Group 211 for the procedure.
  5. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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**Power Steering System Flushing**

## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

**NOTICE:** Do not mix fluid types. Any mixture or any unapproved fluid may lead to seal deterioration and leaks. A leak may ultimately cause loss of fluid, which may result in a loss of power steering assist.

1. Remove the power steering fluid reservoir cap.
2. Using a suitable suction device, remove the power steering fluid from the reservoir.
3. Release the clamp and disconnect the return hose from the reservoir.
  - Remove the clamp from the hose and allow the remaining fluid to drain out of the reservoir.
4. Plug the power steering fluid reservoir inlet port.
5. Attach an extension hose to the return hose.
6. **NOTE:** Do not reuse the power steering fluid that has been flushed from the power steering system.

Place the open end of the extension hose into a suitable container.

7. If equipped with Hydro-Boost®, apply the brake pedal 4 times.
8. **NOTE:** Do not overfill the reservoir.

Fill the reservoir as needed with the specified fluid.

9. **NOTICE:** Do not allow the power steering pump to run completely dry of power steering fluid. Damage to the power steering pump may occur.

Start the engine while simultaneously turning the steering wheel to lock and then immediately turn the ignition switch to the OFF position.

10. **NOTE:** Avoid turning the steering wheel without the engine running as this may cause air to be pulled into the steering gear.

**NOTE:** Do not overfill the reservoir.

Fill the reservoir as needed with the specified fluid.

11. Repeat Steps 8 and 9, turning the steering wheel in the opposite direction each time, until the fluid exiting the power steering fluid return hose is clean and clear of foreign material.

12. Remove the extension hose from the return hose.
13. Remove the plug from the fluid reservoir inlet port.
14. Install the clamp and connect the power steering return hose to the reservoir.
15. **NOTE:** It is necessary to correctly fill the power steering system to remove any trapped air and completely fill the power steering system components.



If, after correctly filling the power steering system, there is power steering noise accompanied by evidence of aerated fluid and there are no fluid leaks, it may be necessary to purge the power steering system. For additional information, refer to Power Steering System Purging in this section.

Fill the power steering system. For additional information, refer to Power Steering System Filling in this section.

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**Power Steering System Purging**

## Special Tool(s)

 ST2670-A	Evacuation Cap, Power Steering 211-265 or equivalent
 ST1176-A	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent

## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

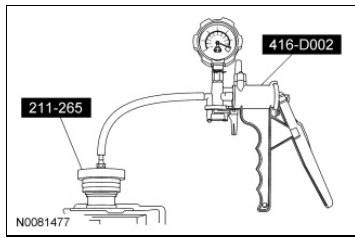
**NOTICE:** If the air is not purged from the power steering system correctly, power steering pump failure may result. The condition may occur on pre-delivery vehicles with evidence of aerated fluid or on vehicles that have had steering component repairs.

If equipped with a fire suppression system, depower the system.

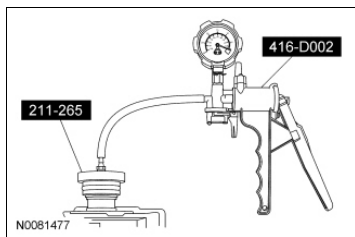
2. **NOTE:** A whine heard from the power steering pump can be caused by air in the system. The power steering purge procedure must be carried out prior to any component repair for which power steering noise complaints are accompanied by evidence of aerated fluid.

Remove the power steering fluid reservoir cap.


- Fill the reservoir as needed with the specified fluid.
3. Raise the front wheels off the floor. Refer to the appropriate section in Group **100** for the procedure.
  4. Tightly insert the Power Steering Evacuation Cap into the reservoir and connect the Vacuum Pump Kit.



5. Start the engine.
6. Using the Vacuum Pump Kit, apply vacuum and maintain the maximum vacuum of 68-85 kPa (20-25 in-Hg).
7. If equipped with Hydro-Boost®, apply the brake pedal twice.
8. **NOTICE: Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.**  
  
Cycle the steering wheel fully from stop-to-stop 10 times.
9. Stop the engine.
10. Release the vacuum and remove the Vacuum Pump Kit.
11. **NOTE:** Do not overfill the reservoir.  
  
Fill the reservoir as needed.
12. Start the engine.
13. Install the Power Steering Evacuation Cap and the Vacuum Pump Kit. Apply and maintain the maximum vacuum of 68-85 kPa (20-25 in-Hg).



14. **NOTICE: Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.**  
  
Cycle the steering wheel fully from stop-to-stop 10 times.
15. Stop the engine, release the vacuum and remove the Vacuum Pump Kit and Power Steering Evacuation Cap.
16. **NOTE:** Do not overfill the reservoir.  
  
Fill the reservoir as needed and install the reservoir cap.
17. Visually inspect the power steering system for leaks.




18.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

If equipped with a fire suppression system, repower the system.

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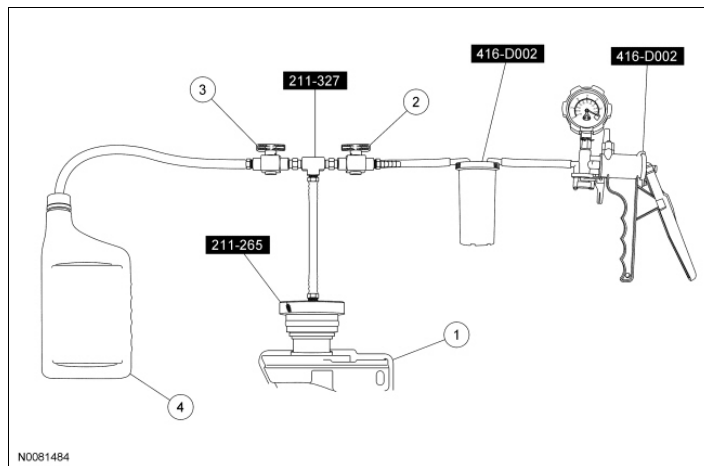
**Power Steering System Filling**

## Special Tool(s)

	Evacuation Cap, Power Steering 211-265
	Fill Adapter Manifold, Power Steering 211-327
	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent

## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



Item	Description
1	Power steering fluid reservoir
2	Control valve (vacuum side)
3	Control valve (fluid container side)
4	Fluid container

- NOTICE:** If the air is not purged from the power steering system correctly, premature power steering pump failure may result. The condition can occur on pre-delivery vehicles with evidence of aerated fluid or on vehicles that have had steering component repairs.



Remove the power steering fluid reservoir cap.

2. Install the Power Steering Evacuation Cap, Power Steering Fill Adapter Manifold and Vacuum Pump Kit as shown in the illustration.

3. **NOTE:** The Power Steering Fill Adapter Manifold control valves are in the OPEN position when the points of the handles face the center of the Power Steering Fill Adapter Manifold.

Close the Power Steering Fill Adapter Manifold control valve (fluid side).

4. Open the Power Steering Fill Adapter Manifold control valve (vacuum side).

5. Using the Vacuum Pump Kit, apply 68-85 kPa (20-25 in-Hg) of vacuum to the power steering system.

6. Observe the Vacuum Pump Kit gauge for 30 seconds.

7. If the Vacuum Pump Kit gauge reading drops more than 3 kPa (0.88 in-Hg), correct any leaks in the power steering system or the Power Steering Evacuation Cap, Power Steering Fill Adapter Manifold and Vacuum Pump Kit before proceeding.

8. **NOTE:** The Vacuum Pump Kit gauge reading will drop slightly during this step.

Slowly open the Power Steering Fill Adapter Manifold control valve (fluid side) until power steering fluid completely fills the hose and then close the control valve.

9. Using the Vacuum Pump Kit, apply 68-85 kPa (20-25 in-Hg) of vacuum to the power steering system.

10. Close the Power Steering Fill Adapter Manifold control valve (vacuum side).

11. Slowly open the Power Steering Fill Adapter Manifold control valve (fluid side).

12. Once power steering fluid enters the fluid reservoir and reaches the minimum fluid level indicator line on the reservoir, close the Power Steering Fill Adapter Manifold control valve (fluid side).

13. Remove the Power Steering Evacuation Cap, Power Steering Fill Adapter Manifold and Vacuum Pump Kit.

14. Install the reservoir cap.

15. **NOTICE:** Do not hold the steering wheel against the stops for an extended amount of time. Damage to the power steering pump may occur.

**NOTE:** There will be a slight drop in the power steering fluid level in the reservoir when the engine is started.

Start the engine and turn the steering wheel from stop-to-stop.

16. Turn the ignition switch to the OFF position.

17. **NOTE:** Do not overfill the reservoir.

Remove the reservoir cap and fill the reservoir with the specified fluid.

18. Install the reservoir cap.



## Material

Item	Specification	Fill Capacity
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	0.94L (2.0 pt) <sup>a</sup>
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B	-

<sup>a</sup> Capacities listed are average system capacities and may vary.

## Torque Specifications

Description	Nm	lb-ft	lb-in
Cooling module mounting bracket bolts	10	-	89
Inner tie rod	100	74	-
Outer tie-rod end nuts	80	59	-
Power steering fluid reservoir bolt	12	-	106
Power steering pump bolts	30	22	-
Pressure line bracket-to-engine nut	8	-	71
Pressure line-to-pump fitting	75	55	-
Steering column shaft-to-steering gear bolt	30	22	-
Steering gear nuts	103	76	-
Steering gear studs	20	-	177
Steering gear turn tube fitting	22	16	-
Steering line clamp plate bolt	17	-	150
Tie-rod jam nut	55	41	-



## Power Steering

### Power Steering - Hydraulic System

The power steering system consists of the following components:

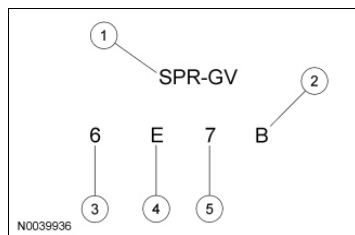
- Power steering pump
- Fluid reservoir
- Rack-and-pinion steering gear
- Fluid cooler
- Power steering pressure and return lines/hoses
- Inner tie rod

The power steering system uses a vane-type pump to pump the fluid from the reservoir to the rack-and-pinion steering gear. The power steering pump is mounted to the engine and is driven by the accessory belt from the engine crankshaft. Power steering fluid is pulled into one side of the pump from the reservoir by vacuum. The power steering fluid is then trapped and squeezed into a smaller area inside the pump. This action pressurizes the fluid as it flows to the rest of the system. A pressure relief/flow valve is built into the pump to control the maximum pressure. The relief pressure is between 9,652-10,687 kPa (1,400-1,550 psi). This action prevents damage to the system during different engine speeds. The power steering fluid, while under pressure, flows through the high pressure power steering line to the rack-and-pinion steering gear.

### Power Steering Gear Identification

**NOTE:** Always use the identification code when ordering service parts.

The steering gear identification code is stamped into the housing.

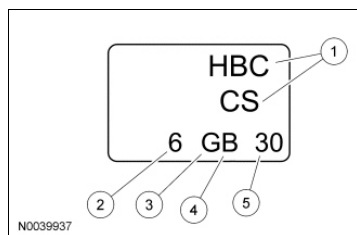


Item	Part Number	Description
1	-	Steering gear model code
2	-	Shift code
3	-	Build year
4	-	Month code (A = Jan., B = Feb., etc., I is not used)
5	-	Day code

### Power Steering Pump Identification

**NOTE:** Always use the identification code when ordering service parts.

The pump identification code is located on a tag attached to the power steering pump.



Item	Part Number	Description
1	-	Model code
2	-	Year
3	-	Month (A = Jan., B = Feb., etc., I is not used)
4	-	Shift
5	-	Day of the month

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## **Power Steering**

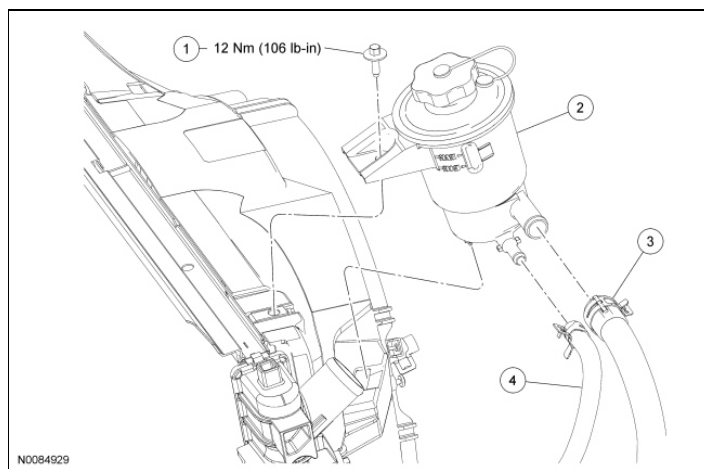
Refer to Section 211-00 .

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**Power Steering Fluid Reservoir**

## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



Item	Part Number	Description
1	N606676	Power steering fluid reservoir bolt
2	3E764	Power steering fluid reservoir
3	3691	Power steering pump supply hose
4	3A713	Return hose

**Removal and Installation**

**NOTICE:** While repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.


1. Using a suitable suction device, remove the power steering fluid from the reservoir.
2. Release the clamps and disconnect the power steering pump supply hose and the return hose.
3. Remove the bolt and the power steering fluid reservoir.
  - To install, tighten to 12 Nm (106 lb-in).
4. To install, reverse the removal procedure.
5. Fill the power steering system. For additional information, refer to Section 211-00.





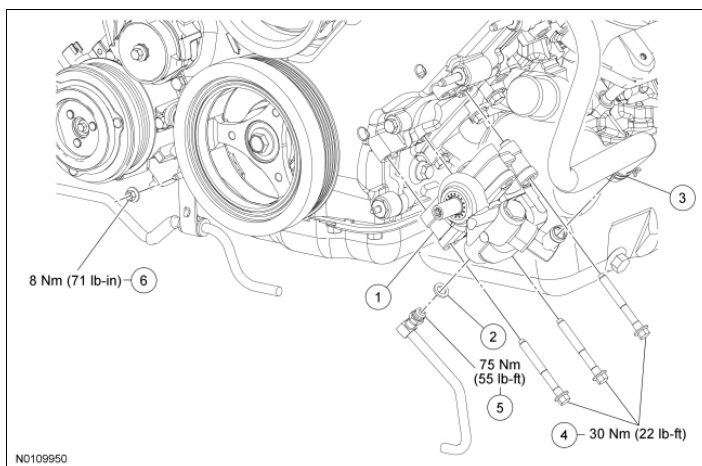
**Power Steering Pump**

## Special Tool(s)

 ST1444-A	Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent
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## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



Item	Part Number	Description
1	3A674	Power steering pump
2	388898	Teflon® seal
3	3691	Power steering pump supply hose
4	W500315	Power steering pump bolts (3 required)
5	-	Pressure line-to-pump fitting (part of 3A719)
6	N621906	Pressure line bracket-to-engine nut

**Removal and Installation**

**NOTICE:** While repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

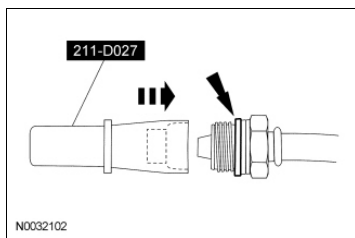
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.

If equipped with a fire suppression system, depower the system.

2. Using a suitable suction device, remove the power steering fluid from the reservoir.
3. Remove the power steering pump pulley. For additional information, refer to Power Steering Pump Pulley in this section.
4. Release the clamp and disconnect the power steering pump supply hose.
5. Remove the pressure line bracket-to-engine nut.
  - To install, tighten to 8 Nm (71 lb-in).
6. Disconnect the pressure line-to-pump fitting.
  - Discard the Teflon® seal.
  - ♦ To install, tighten to 75 Nm (55 lb-ft).
7. Remove the 3 bolts and the power steering pump.
  - To install, tighten to 30 Nm (22 lb-ft).
8. **NOTE:** When connecting a fitting with a Teflon® seal, a new Teflon® seal must be installed.

To install, reverse the removal procedure.

- Using the Teflon® Seal Installer Set, install a new Teflon® seal on the pressure line-to-pump fitting.





9. Fill the power steering system. For additional information, refer to Section 211-00 .
10. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

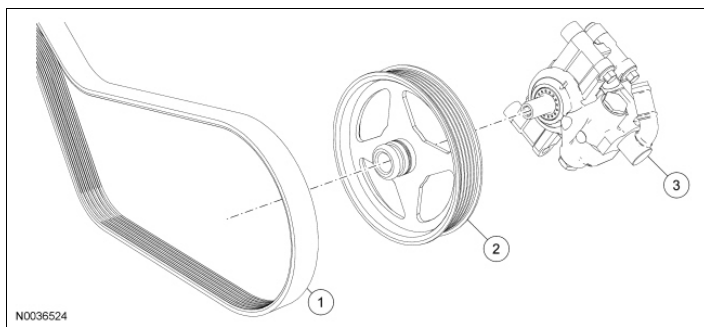
If equipped with a fire suppression system, repower the system.



**Power Steering Pump Pulley**

## Special Tool(s)

 ST1586-A	Installer, Power Steering Pump Pulley 211-185 (T91P-3A733-A)
 ST1290-A	Remover, Power Steering Pump Pulley 211-016 (T69L-10300-B)



Item	Part Number	Description
1	8620	Accessory drive belt
2	3D673	Power steering pump pulley
3	3A674	Power steering pump

**Removal and Installation**

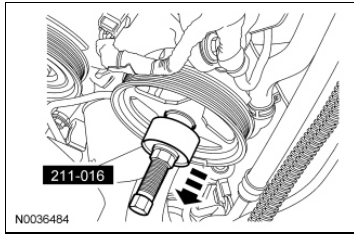
**NOTICE:** Do not install a power steering pump pulley that has been removed and installed twice or pulley failure and/or pump damage may occur. Inspect the pulley for paint marks in the web area near the hub. If there are 2 paint marks, discard the pulley and install a new one. If there is one paint mark or no paint marks, use a paint pencil to mark the web area of the pulley near the hub.

1. Remove the accessory drive belt from the power steering pump pulley. For additional information, refer to [Section 303-05](#).
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

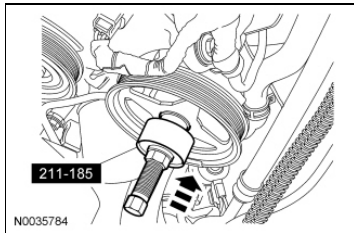
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

3. **NOTICE:** Do not apply pressure on the power steering pump rotor shaft. Pressure may damage the internal thrust areas of the power steering pump.

Using the Power Steering Pump Pulley Remover, remove the pulley.



4. To install, reverse the removal procedure.
  - Use the Power Steering Pump Pulley Installer to install the pulley.



5. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system.  
For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

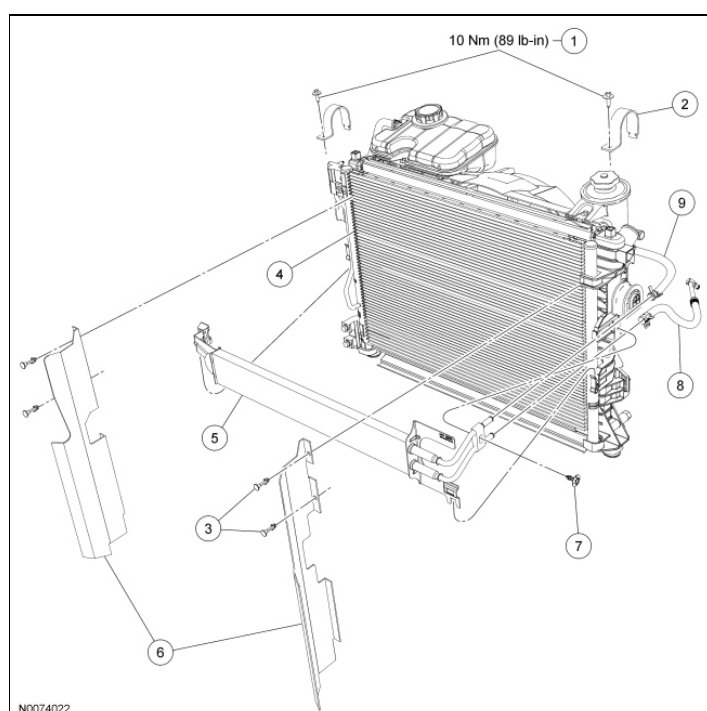
If equipped with a fire suppression system, repower the system.

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**Power Steering Fluid Cooler**

## Material

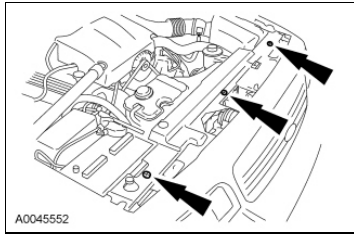
Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



Item	Part Number	Description
1	N606676	Cooling module mounting bracket bolts (2 required)
2	8125	Cooling module mounting bracket (2 required)
3	N806799	Cooling module side shield pin-type retainers (4 required)
4	8005	Radiator
5	3D746	Power steering fluid cooler
6	19E572	Cooling module side shields (2 required)
7	41201	Power steering fluid cooler pin-type retainer
8	3A713	Return hose
9	3A713	Return hose

**Removal and Installation**

1. Using a suitable suction device, remove the power steering fluid from the reservoir.
2. Remove the pin-type retainers and the radiator cover shield.



3. Remove the battery and battery tray. For additional information, refer to [Section 414-01](#) .

4. Remove the cooling module mounting bracket bolts.

- To install, tighten to 10 Nm (89 lb-in).
- ♦ Slide mounting brackets off the cooling module.

5. **NOTICE:** While repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

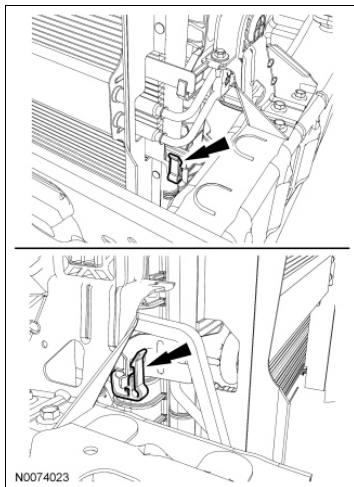
Release the clamps and disconnect the 2 return hoses from the fluid cooler.

- Clamp off the hoses to prevent excess fluid loss.

6. Remove the upper 2 pin-type retainers from both sides of the cooling module side shields.

7. Remove the power steering fluid cooler pin-type retainer.

8. Position the radiator rearward, release the 2 cooler retaining clips and remove the power steering fluid cooler.



9. To install, reverse the removal procedure.


10. Fill the power steering system. For additional information, refer to [Section 211-00](#) .





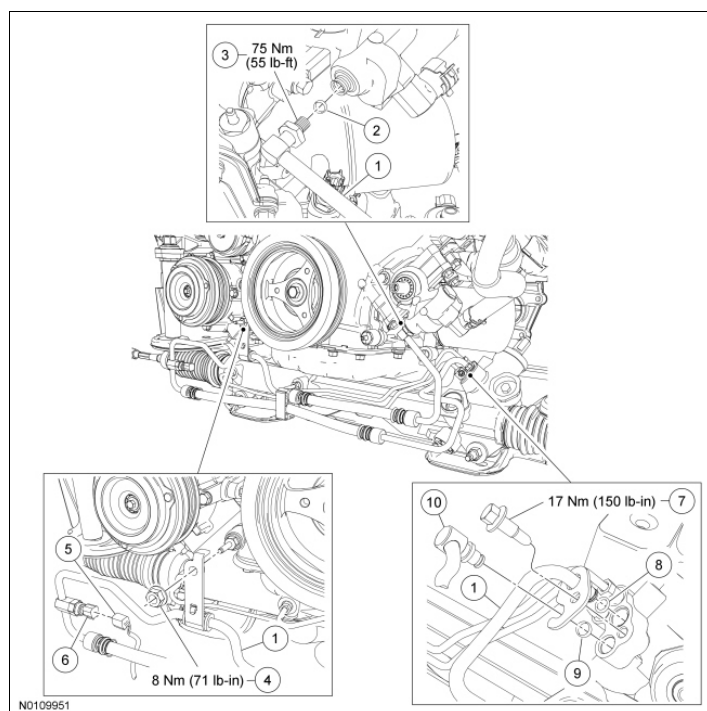
**Power Steering Pump to Steering Gear Pressure Line**

## Special Tool(s)

 ST1444-A	Installer Set, Teflon® Seal 211-D027 (D90P-3517-A) or equivalent
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## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



Item	Part Number	Description
1	3A719	Pressure line
2	388898	Teflon® O-ring seal
3	-	Pressure line-to-pump fitting (part of 3A719)
4	N621906	Pressure line bracket-to-engine nut
5	-	Power Steering Pressure (PSP) switch electrical connector (part of 14A464)
6	3N824	PSP switch
7	W707622	Steering line clamp plate bolt

8	3F886	High-pressure O-ring seal
9	3F886	Low-pressure O-ring seal
10	3A713	Return line

### Removal and Installation

**NOTICE:** While repairing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

2. **NOTICE:** New O-ring seals must be installed any time the lines are disconnected from the steering gear or a leak may occur.

Remove the steering line clamp plate bolt and disconnect the pressure and return lines from the steering gear.

- Discard the O-ring seals.
- To install, tighten to 17 Nm (150 lb-in).

3. Remove the pressure line bracket-to-engine nut.
  - To install, tighten to 8 Nm (71 lb-in).

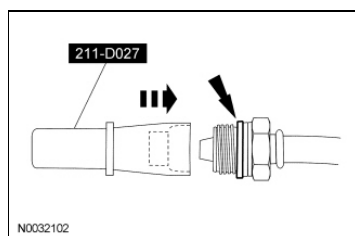
4. Disconnect the Power Steering Pressure (PSP) switch electrical connector.

5. Disconnect the pressure line-to-pump fitting.
  - Discard the Teflon® seal.
  - ♦ To install, tighten to 75 Nm (55 lb-ft).

6. **NOTE:** When connecting a fitting with a Teflon® seal, a new seal must be installed.

To install, reverse the removal procedure.

- Using the Teflon® Seal Installer Set, install a new Teflon® seal on the pressure line-to-pump fitting.



7. Fill the power steering system. For additional information, refer to [Section 211-00](#) .

8. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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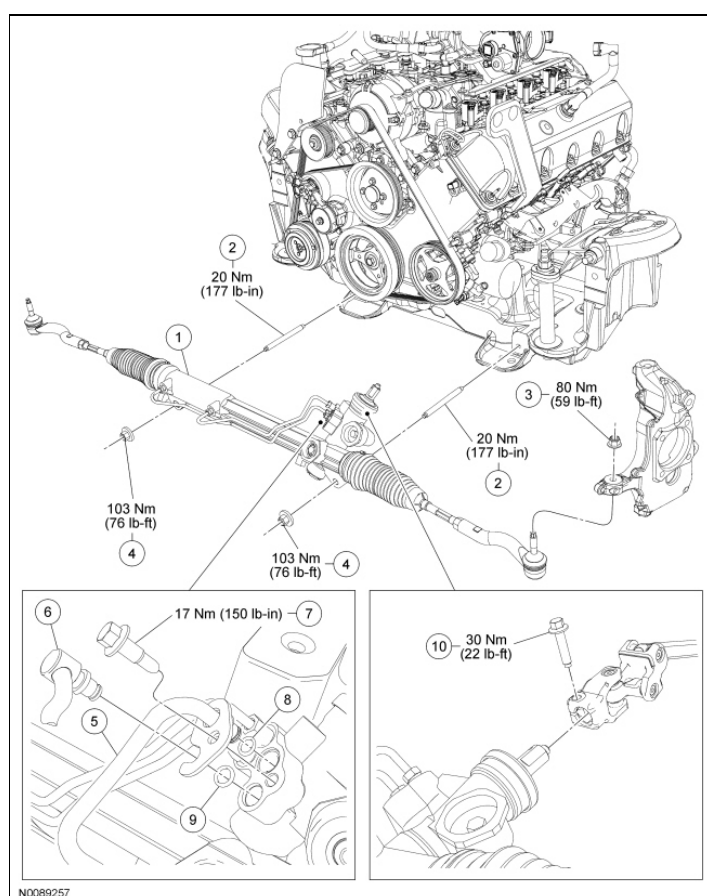
# SECTION 211-02: Power Steering REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

## Steering Gear

### Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



N0089257

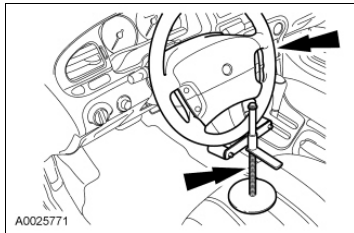
Item	Part Number	Description
1	3504	Steering gear
2	W707972	Steering gear studs (2 required)
3	W520214	Outer tie-rod end nut
4	W707492	Steering gear nuts (2 required)
5	3A719	Pressure line
6	3A713	Return line
7	W707622	Steering line clamp plate bolt
8	3F886	High-pressure O-ring seal
9	3F886	Low-pressure O-ring seal
10	W710821	Steering column shaft-to-steering gear coupling bolt

## Removal and Installation

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A** .

2. Using a suitable holding device, hold the steering wheel in the straight-ahead position.



3. **NOTICE:** Do not allow the steering column shaft to rotate while the steering column is disconnected from the steering gear or damage to the clockspring may result. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to **Section 501-20B** .

From the engine compartment, remove the steering column shaft-to-steering gear coupling bolt and detach the shaft from the steering gear.

- To install, tighten to 30 Nm (22 lb-ft).

4. **NOTE:** The hex-holding feature can be used to prevent turning of the stud while removing the nut.

Remove the nuts and detach the outer tie-rod ends from the wheel knuckles.

- To install, tighten to 80 Nm (59 lb-ft).

5. **NOTICE:** New O-ring seals must be installed any time the lines are disconnected from the steering gear or a leak may occur.

Remove the steering line clamp plate bolt and disconnect the pressure and return lines.

- Discard the O-ring seals.
- To install, tighten to 17 Nm (150 lb-in).


6. Remove the steering gear nuts.
  - To install, tighten to 103 Nm (76 lb-ft).

7. Remove the steering gear studs and the steering gear.
  - To install, tighten to 20 Nm (177 lb-in).

8. **NOTE:** When connecting a fitting with an O-ring seal, a new seal must be installed.

To install, reverse the removal procedure.

9. Fill the power steering system. For additional information, refer to **Section 211-00** .

10.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

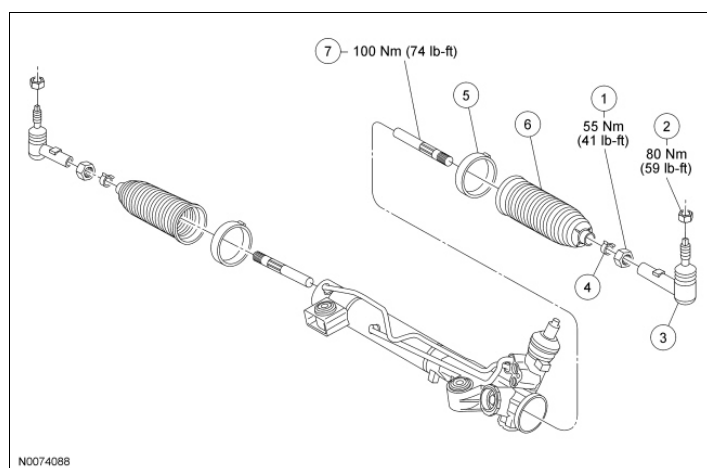
If equipped with a fire suppression system, repower the system.

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**Inner Tie Rod**

## Material

Item	Specification
Premium Long-Life Grease XG-1-C or XG-1-K (US); CXG-1-C (Canada)	ESA-M1C75-B



Item	Part Number	Description
1	3N807	Tie-rod jam nut (part of 3280) (2 required)
2	W520214	Outer tie-rod end nut (2 required)
3	3A130	Outer tie-rod end (2 required)
4	3C650	Outer bellows boot clamp (2 required)
5	3K745	Inner bellows boot clamp (2 required)
6	3K661	Steering gear bellows boot (2 required)
7	3280	Inner tie rod (2 required)

**Removal and Installation**

**NOTICE:** The bellows boots and clamps are designed to provide an airtight seal and protect the internal components of the steering gear. If the seal is not airtight, the vacuum generated during turning will draw water and foreign material into the gear. Zip ties do not produce an airtight seal and must not be used.

**NOTICE:** The inner tie-rod ball socket grease is not compatible with water. Water trapped in the grease will damage the joint.

**NOTICE:** If present, the orientation of the vent tube must be noted so the boots and vent tubes may be installed in the correct location. Incorrect venting may lead to internal component damage.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B**. Failure to follow the instructions may result in serious personal injury.



Remove the wheel and tire. For additional information, refer to [Section 204-04](#) .

2. Loosen the tie-rod jam nut.

- To install, tighten to 55 Nm (41 lb-ft).

3. **NOTE:** The hex-holding feature can be used to prevent turning of the stud while removing the nut.

Remove the nut and detach the outer tie-rod end from the wheel knuckle.

- To install, 80 Nm (59 lb-ft).

4. **NOTE:** Note the number of times the outer tie-rod end turns for assembly reference.

Remove the outer tie-rod end.

5. Remove the tie-rod jam nut.

6. **NOTE:** If repairing the inner tie rod on the RH side, it will be necessary to pull back the bellows boot on the LH side to hold the steering gear.

Remove the inner and outer bellows boot clamps.

- Remove the bellows boot.

7. **NOTICE:** Place the steering gear at the center position. Use an appropriate-sized crowfoot wrench on the flat of the rack gear to resist rotation and prevent damage during removal and installation of the inner tie rod.

**NOTE:** An assistant may be needed for removal of the RH inner tie rod.

While holding the steering gear rack, use an appropriate-sized crowfoot wrench to remove the inner tie rod.

- To install, tighten to 100 Nm (74 lb-ft).

8. **NOTICE:** Thoroughly remove any abrasive material. This material is extremely harmful to the steering gear.

**NOTICE:** Make sure that the bellows boot is not twisted or damage to the boot may occur.

**NOTICE:** Lubricate the inner tie-rod inner groove with grease where the bellows boot is clamped. Make sure that the bellows boot is positioned correctly over the steering gear housing bead at the large ID and is in the inner tie-rod groove at the small ID.

To install, reverse the removal procedure.

- Thoroughly clean and inspect all the parts to be reused. Install new parts as necessary.

9. Check and, if necessary, adjust the front toe. For additional information, refer to [Section 204-00](#) .

10. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.

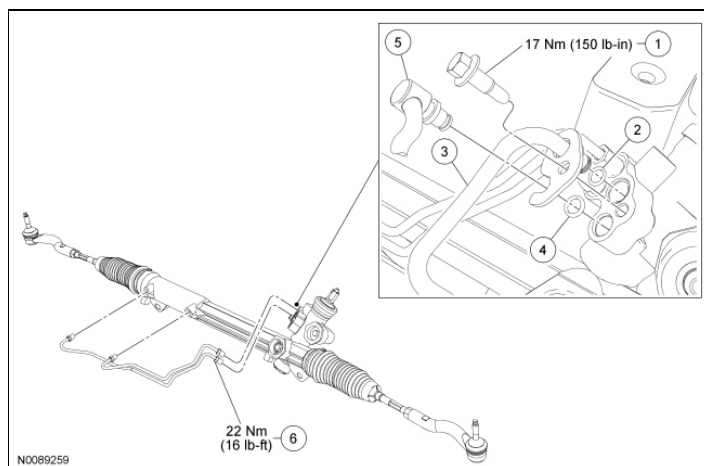
If equipped with a fire suppression system, repower the system.

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**Steering Gear Turn Tubes**

## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V



Item	Part Number	Description
1	W707622	Steering line clamp plate bolt
2	3F886	High-pressure O-ring seal
3	3A719	Pressure line
4	3F886	Low-pressure O-ring seal
5	3A713	Return line
6	3A714	Steering gear turn tube (2 required)

- ⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#) . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#) .

- NOTICE:** New O-ring seals must be installed any time the lines are disconnected from the steering gear or a leak may occur.

Remove the steering line clamp plate bolt and disconnect the pressure and return lines.

- Discard the O-ring seals.
- To install, tighten to 17 Nm (150 lb-in).

3. **NOTE:** When removing the steering gear turn tubes, remove any Teflon® O-ring seals remaining in the gear ports of the steering gear.


Remove the 2 steering gear turn tubes.

- To install, tighten to 22 Nm (16 lb-ft).

4. **NOTE:** When connecting a fitting with an O-ring seal, a new seal must be installed.

To install, reverse the removal procedure.

5. Fill the power steering system. For additional information, refer to Section 211-00 .

6.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

If equipped with a fire suppression system, repower the system.

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## Material

Item	Specification	Fill Capacity
Multi-Purpose Grease XG-4 and/or XL-5, or equivalents	ESB-M1C93-B	-

## Torque Specifications

Description	Nm	lb-ft	lb-in
Clockspring mounting bracket screws	8	-	71
Gearshift lever screw	18	-	159
Ignition switch screw	5	-	44
Lower steering column shaft-to-steering gear bolt	30	22	-
Lower steering column shroud screws	2	-	18
Shift cable bracket bolts	9	-	80
Steering column nuts	30	22	-
Steering wheel bolt	40	30	-
Transmission range indicator screw	5	-	44
Upper steering column shaft bearing nuts	11	-	97
Upper steering column shaft-to-lower steering column shaft bolt	48	35	-
Upper steering column shaft-to-steering column bolt	30	22	-

## Steering Column

The steering column consists of the following:

- Steering wheel
- Steering column
- Upper and lower steering column shafts
- Steering column switches

The steering column is the mechanical linkage between the steering wheel and the steering gear. The steering wheel is mounted to a shaft, which passes through the center of the steering column. The shaft is centered by bearings within the steering column. The steering column shaft then connects the steering column to the steering gear. The upper and lower steering column shaft connections utilize U-joint type couplings. The tilt function of the steering column is controlled by a mechanical lever on the underside of the steering column, which uses a cam to lock and unlock the steering column. When the tilt column lever is unlocked, the steering column can then be adjusted to various positions. The steering column switches (multifunction and ignition) are mounted to the steering column. These switches are covered by the upper and lower steering column shrouds.

Vehicles that are equipped with Passive Anti-Theft System (PATS) do not have a steering column locking function that prevents the steering wheel/column from rotating. Steering columns that are not equipped with PATS can be locked by placing the ignition key in the OFF position and removing the key.

For steering column switch service information, refer to [Section 211-05](#) .

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## **Steering Column**

Refer to Section 211-00 .

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**Steering Wheel Wrap Bonding**

## Material

Item	Specification
Instant Gel Adhesive TA-19	WSK-M2G402-A4

1. **NOTE:** If re-adhering leather to the front side of the steering wheel only, it will not be necessary to remove the steering wheel. Steering wheel removal is necessary only when repairing loose leather on the backside of the steering wheel.

If necessary remove the steering wheel. For additional information, refer to Steering Wheel in this section.

2. Position the loose leather out of the way.
3. Apply the specified adhesive evenly over the wheel spoke.
4. Position the loose leather back into the original position.
5. **NOTE:** The adhesive should be completely set after 5 minutes. Do not pull on the repair area.

Smooth the leather and tuck in for neat appearance.

- Apply pressure (for at least 30 seconds) until the leather is bonded to the wheel spoke.

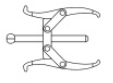
6. If removed, Install the steering wheel. For additional information, refer to Steering Wheel in this section.
-

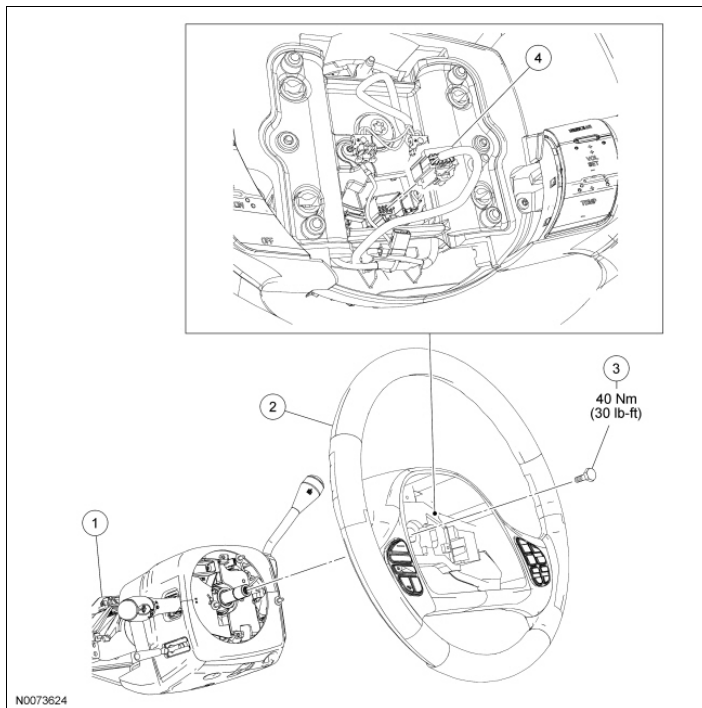




**Steering Wheel**

## Special Tool(s)

 ST1321-A	Remover, Differential Bearing 205-116 (T77F-4220-B1) or equivalent
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Item	Part Number	Description
1	3C529	Steering column
2	3600	Steering wheel
3	W705317	Steering wheel bolt
4	-	Steering wheel switches electrical connector (part of 13B319)

**Removal and Installation**

1. **NOTE:** Make sure the wheels are in the straight-ahead position.

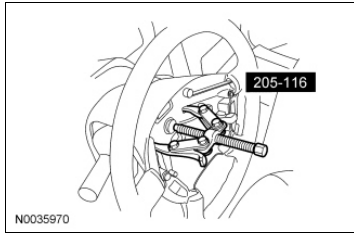
Remove the driver air bag module. For additional information, refer to [Section 501-20B](#) .

2. Loosen the steering wheel bolt.

3. **NOTICE:** Removing the steering wheel without using a puller may damage the column bearings.

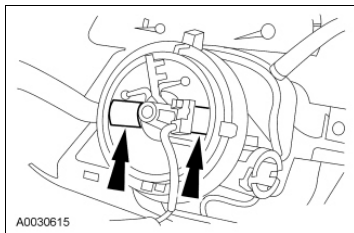
**NOTE:** Do not remove the steering wheel bolt until the steering wheel has been separated from the steering column shaft.

Using the Differential Bearing Remover, separate the steering wheel from the steering column shaft.



4. Remove and discard the steering wheel bolt.
  - To install, tighten the new bolt to 40 Nm (30 lb-ft).
5. Disconnect the steering wheel switches electrical connector from the clockspring and remove the steering wheel.
  - Carefully rotate the air bag harness wires through the opening in the steering wheel.
6. **NOTICE: Do not allow the clockspring to turn from its removal position or damage to the clockspring may occur.**

Tape the clockspring center rotor to the outer housing to keep it from rotating.

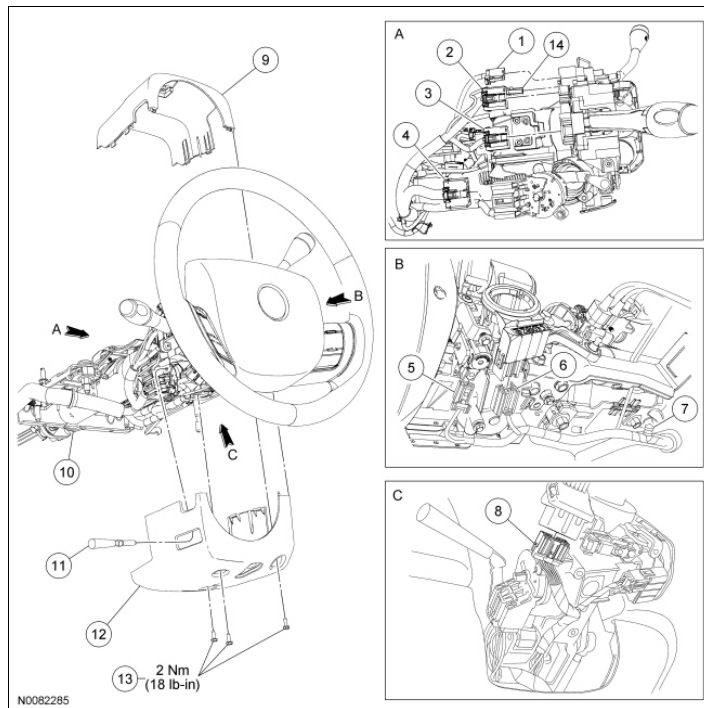


7. To install, reverse the removal procedure.
-

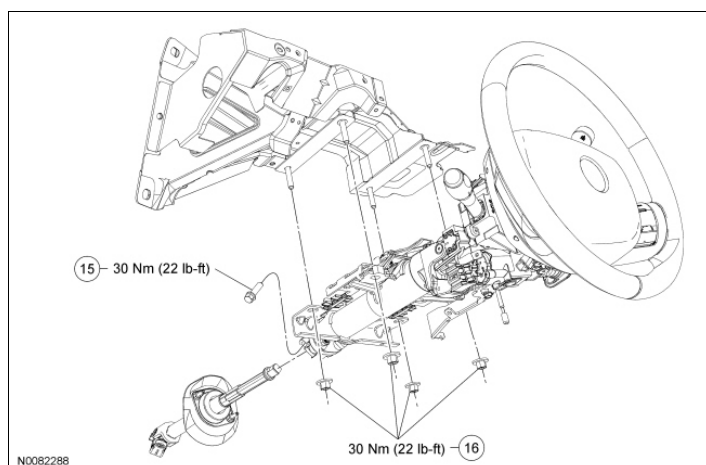
# SECTION 211-04: Steering Column REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

## Steering Column



Item	Part Number	Description
1	-	Multifunction switch electrical connector (part of 14401)
2	-	Multifunction switch electrical connector (part of 14401)
3	-	Multifunction switch electrical connector (part of 14401)
4	-	Ignition switch electrical connector (part of 14401)
5	-	Brake shift interlock solenoid electrical connector (part of 14401)
6	-	Passive Anti-Theft System (PATS) electrical connector (part of 14401)
7	-	Wiring harness retainer (part of 14401)
8	-	Clockspring electrical connector (part of 14401)
9	3530	Upper steering column shroud
10	3C529	Steering column
11	3F609	Steering column tilt lever shank
12	3530	Lower steering column shroud
13	55929	Lower steering column shroud screws (3 required)
14	-	Overdrive cancel switch electrical connector (part of 14401)



Item	Part Number	Description
15	N803942	Upper steering column shaft-to-steering column bolt
16	N806423	Steering column nuts (4 required)

**All vehicles**

1. Place the steering wheel in the straight-ahead position.
2. Depower the Supplemental Restraint System (SRS). For additional information, refer to [Section 501-20B](#).
3. Remove the steering column opening trim panel and reinforcement. For additional information, refer to Instrument Panel in [Section 501-12](#).
4. **NOTE:** Release the upper steering column shroud by pressing the sides inward.

Remove the upper shroud and the 3 screws holding the lower shroud to the steering column.

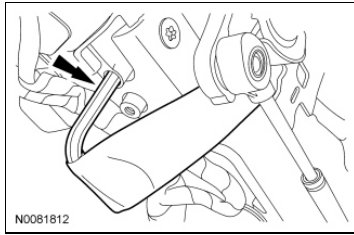
- To install, tighten to 2 Nm (18 lb-in).

5. Disconnect the 3 multifunction switch electrical connectors.
6. Disconnect the ignition switch electrical connector.
7. Disconnect the clockspring electrical connector.

**Vehicles equipped Passive Anti-Theft System (PATS)**

8. Disconnect the Passive Anti-Theft System (PATS) sensor electrical connector.
  - Release the wiring harness pin-type retainer.
9. **NOTE:** Vehicles that are equipped with PATS do not have a steering column locking function that prevents the steering wheel/column from rotating.

Insert a 4 mm (0.157 in) Allen wrench (or equivalent) into the hole located on the underside of the tilt housing and secure it with a piece of tape. This will prevent steering wheel/column rotation once the steering column shaft has been disconnected.

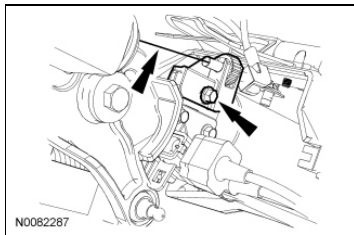


### Vehicles without PATS

10. Place the ignition key in the OFF position and remove the ignition key. This will prevent steering wheel/column rotation once the steering column shaft has been disconnected.

### All vehicles

11. Disconnect the shift cable from the shift lever and remove the retaining clip.
  - Release the shift cable pin-type retainer from the steering column.
12. Disconnect the brake shift interlock solenoid and overdrive cancel switch electrical connectors.
13. Disconnect the transmission range indicator from the steering column.
  - Remove the screw.
  - To install, tighten to 5 Nm (44 lb-in).
  - Release the cable from the shift selector arm.



### All vehicles

14. **NOTICE:** Do not allow the steering wheel to rotate while the steering column shaft is disconnected or damage to the clockspring may result. If there is evidence that the steering wheel has rotated, the clockspring must be removed and recentered. For additional information, refer to Section 501-20B.

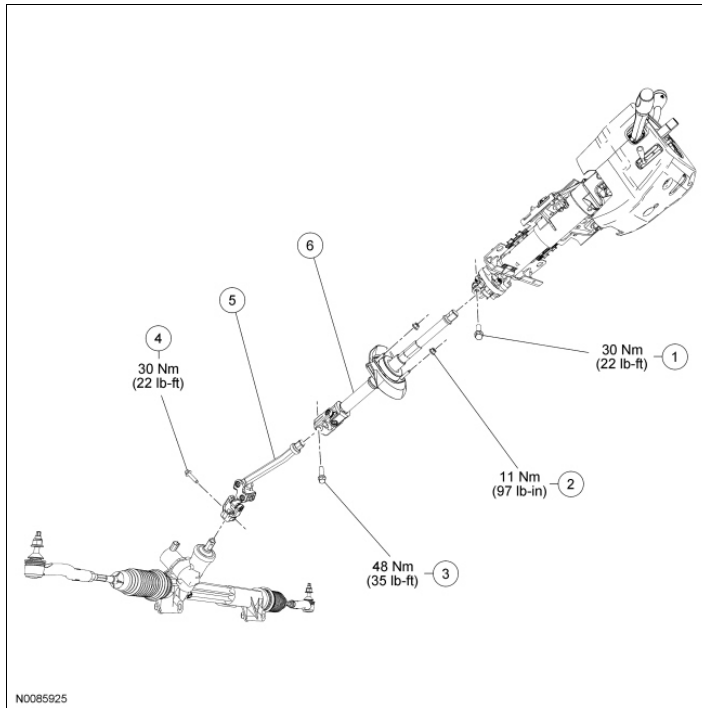
Remove and discard the upper steering column shaft-to-steering column bolt and disconnect the shaft.

- To install, tighten the new bolt to 30 Nm (22 lb-ft).
15. Remove the 4 steering column nuts and the steering column.
    - To install, tighten to 30 Nm (22 lb-ft).
  16. **NOTE:** When installing the steering column, remove the anti-rotation/packaging pin (new column) or the Allen wrench from the underside of the column after the steering column shaft boot has been installed.

To install, reverse the removal procedure.

17. Repower the SRS . For additional information, refer to Section 501-20B.



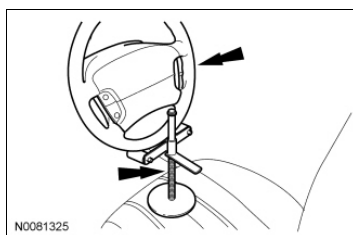
**Steering Column Shaft**

Item	Part Number	Description
1	W710820	Upper steering column shaft-to-steering column bolt
2	N806385	Upper steering column shaft bearing nut (2 required)
3	W710820	Upper steering column shaft-to-lower intermediate shaft bolt
4	W710821	Lower steering column shaft-to-steering gear bolt
5	3B676B	Lower steering column shaft
6	3B676A	Upper steering column shaft

**Removal and Installation**

1. Depower the Supplemental Restraint System (SRS). For additional information, refer to [Section 501-20B](#).
2. **NOTE:** Use a steering wheel holding device (such as Hunter® 28-75-1 or equivalent).

Using a suitable holding device, hold the steering wheel in the straight-ahead position.





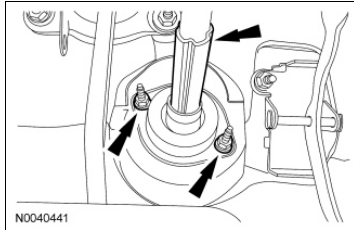
3. **NOTICE:** Do not allow the steering wheel to rotate while the steering column intermediate shaft is disconnected or damage to the clockspring may result. If there is evidence the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to Section 501-20B .

Remove and discard the upper steering column shaft-to-steering column bolt and disconnect the shaft.

- To install, tighten the new bolt to 30 Nm (22 lb-ft).

4. Remove the 2 upper steering column shaft bearing nuts.

- To install, tighten to 11 Nm (97 lb-in).



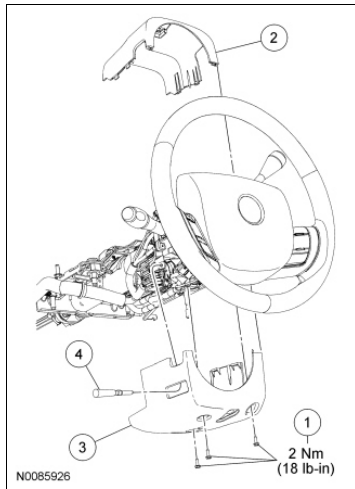
5. Remove and discard the lower steering column shaft-to-steering gear bolt and remove the shaft.

- To install, tighten the new bolt to 30 Nm (22 lb-ft).

6. To install, reverse the removal procedure.

7. Repower the SRS . For more additional information, refer to Section 501-20B .
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**Steering Column Shroud**

Item	Part Number	Description
1	55929	Lower steering column shroud screws (3 required)
2	3530	Upper steering column shroud
3	3530	Lower steering column shroud
4	3F609	Steering column tilt lever shank

**Removal and Installation**

1. Remove the 3 lower steering column shroud screws.
    - To install, tighten to 2 Nm (18 lb-in).
  2. Remove the steering column tilt lever shank.
  3. **NOTE:** Release the upper steering column shroud by pressing the sides inward.  
  
Remove the upper and lower steering column shroud.
  4. To install, reverse the removal procedure.
-



## Steering Column

### Material

Item	Specification
Multi-Purpose Grease XG-4 and/or XL-5, or equivalents	ESB-M1C93-B

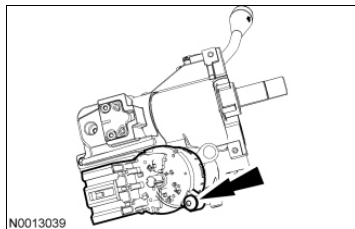
### Disassembly

1. Remove the steering column. For additional information, refer to Steering Column in this section.
2. Remove the steering wheel. For additional information, refer to Steering Wheel in this section.
3. Remove the clockspring. For additional information, refer to Section 501-20B .
4. Remove the multifunction switch. For additional information, refer to Section 211-05 .
5. **NOTICE:** Do not remove the ignition lock cylinder and the ignition switch at the same time or damage to the ignition switch may result.

**NOTE:** Place the ignition key in the ACC position.

Remove the screw and the ignition switch.

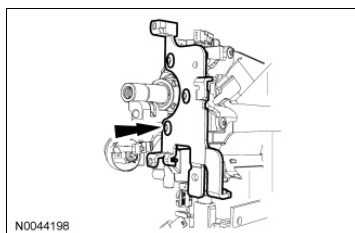
- Discard the screw.



6. **NOTE:** Place the gear shift lever in the lowest gear position by pressing the manual override on the bottom of the brake shift interlock solenoid, if equipped.

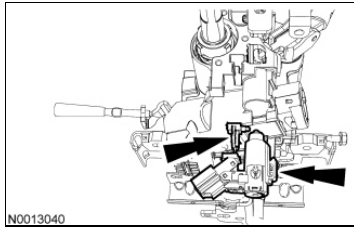
Remove the screw and the clockspring mounting bracket.

- Discard the screw.



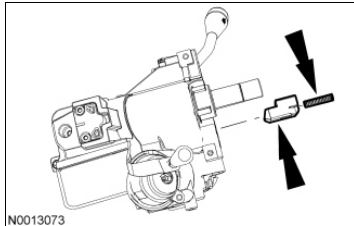
7. Remove the brake shift interlock solenoid.

- Simultaneously pull the park position switch and release the clip.

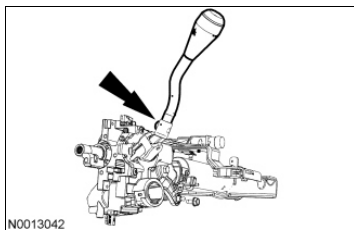


8. Remove the inhibitor spring and the inhibitor.

- Thoroughly clean the grease from the inhibitor spring and the inhibitor.

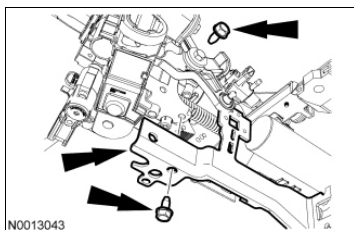


9. Remove the gearshift lever screw and the gearshift lever.



10. Remove the 2 bolts and the shift cable bracket.

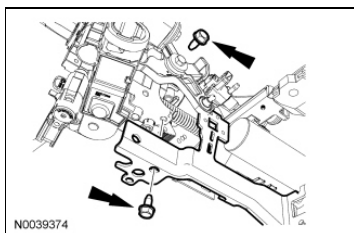
- Discard the 2 bolts.



## Assembly

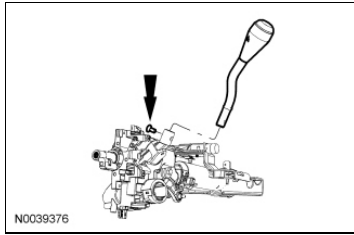
1. Install the shift cable bracket and the 2 new bolts.

- Tighten to 9 Nm (80 lb-in).



2. Install the gearshift lever and a new screw.

- Tighten to 18 Nm (159 lb-in).

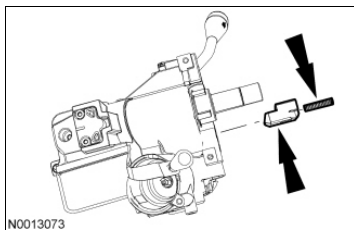


3. **NOTE:** Make sure the pocket in the inhibitor for the brake shift interlock solenoid plunger is free of grease and foreign material.

**NOTE:** Place the gear shift lever in the lowest gear position.

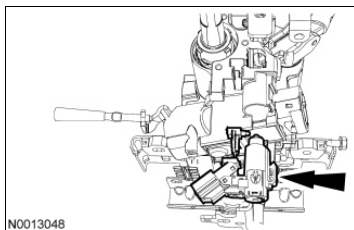
Fully insert the inhibitor into the cavity and install the inhibitor spring.

- Apply grease to the outer surfaces of the inhibitor and in the inhibitor spring pocket.



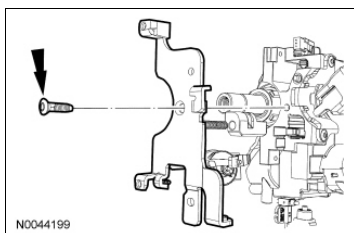
4. Install the brake shift interlock solenoid.

- Simultaneously insert the park position switch and the brake shift interlock solenoid.
- Connect the clip.



5. Install the clockspring mounting bracket and a new screw.

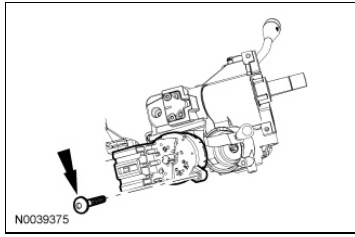
- Tighten to 8 Nm (71 lb-in).



6. **NOTE:** Place the ignition key in the OFF position.

Install the ignition switch and the screw.

- Tighten to 5 Nm (44 lb-in).



7. Install the multifunction switch. For additional information, refer to Section 211-05 .
  8. Install the clockspring. For additional information, refer to Section 501-20B .
  9. Install the steering wheel. For additional information, refer to Steering Wheel in this section.
  10. Install the steering column. For additional information, refer to Steering Column in this section.
-

**Torque Specifications**

Description	Nm	lb-in
Ignition switch screws	5	44
Lower steering column shroud screws	2	18
Multifunction switch screws	3	27

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## **Steering Column Switches**

The steering column switches consist of the following:




- The multifunction switch
- The ignition switch

The steering column switches receive driver inputs and send signals to various components. The integrated multifunction switch is mounted to the LH side of the steering column and controls the turn signals, headlamp low/high beam, headlamp dimmer/flash-to-pass, hazard warning, cornering lamps and windshield washer/wipers. The ignition switch is also mounted to the LH side of the steering column and is used in conjunction with the ignition key to start the vehicle. When the ignition key is switched to different positions, it moves linkages which enable the ignition switch to send battery voltage to various components.

---

## Steering Column Switches

### Special Tool(s)

 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

### Principles of Operation

The steering column switches include the ignition switch and the multifunction switch (high beam/low beam, flash-to-pass, turn signal and windshield wiper).

#### Ignition Switch

The ignition switch is controlled by the ignition lock cylinder with a key. When the ignition lock cylinder is turned using the key, a mechanical connection positions the ignition switch to the selected position and allows the ignition switch to send voltage to the Battery Junction Box (BJB) and the Central Junction Box (CJB). The available ignition switch positions are:

- OFF
- ACC
- RUN
- START

#### Multifunction Switch

**NOTE:** For multifunction switch concerns, refer to one of the following sections:

- For exterior lighting, refer to [Section 417-01](#) .
- For wipers and washers, refer to [Section 501-16](#) .

The multifunction switch controls the various components (high beam headlamps, flash-to-pass, turn signal and windshield wiper) by grounding certain Lighting Control Module (LCM) circuits and wiper motor circuits. When the LCM detects the specific ground, it sends a voltage to the appropriate component to activate it. The LCM controls the high beam headlamps and the flash-to-pass. The turn signals are controlled directly by the multifunction switch. The high beam headlamp and the turn signal portion are normally open switches that close when activated. The flash-to-pass switch is a momentary contact switch that grounds the LCM high beam headlamp circuit. The windshield wipe and wash functions are controlled directly by the multifunction switch, wiper and washer motor.

**Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Ignition key</li> <li>• Ignition switch</li> <li>• Multifunction switch</li> <li>• Steering column shrouds</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 1 (30A)</li> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 1 (10A)</li> <li>◆ 3 (5A)</li> <li>◆ 5 (7.5A)</li> <li>◆ 7 (10A)</li> <li>◆ 9 (7.5A)</li> <li>◆ 11 (15A)</li> <li>◆ 13 (10A)</li> <li>◆ 15 (10A)</li> <li>◆ 17 (10A)</li> <li>◆ 20 (10A)</li> <li>◆ 22 (10A)</li> <li>◆ 24 (10A)</li> <li>◆ 26 (10A)</li> </ul> </li> <li>• Lighting Control Module (LCM)</li> <li>• Wiring, terminals or connectors</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:
  - verify the ignition key is in the ON position.
  - verify the scan tool operation with a known good vehicle.

- refer to [Section 418-00](#) to diagnose no response from the PCM.
7. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#) .
    - If the network test passes, retrieve and record continuous memory DTCs.
  8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .
  9. If the DTCs retrieved are related to the concern, go to Lighting Control Module (LCM) DTC Chart. For all other DTCs, refer to the Master DTC Chart in [Section 419-10](#) .
  10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#) .

### Lighting Control Module (LCM) DTC Chart

DTC	Description	Action
B1352	Ignition Key-In Circuit Failure	REFER to the Master DTC Chart in <a href="#">Section 419-10</a> .
B1359	Ignition RUN/ACC Circuit Failure	<a href="#">GO to Pinpoint Test B</a> .
B1555	RUN/START Input Circuit Failure	<a href="#">GO to Pinpoint Test C</a> .
-	All other LCM DTCs	REFER to the Master DTC Chart in <a href="#">Section 419-10</a> .

### Symptom Chart

### Pinpoint Tests

#### Pinpoint Test A: No Power in All Ignition Switch Positions

Refer to Wiring Diagrams Cell [13](#) , Power Distribution for schematic and connector information.

#### Normal Operation

Battery voltage is provided to Battery Junction Box (BJB) fuse 1 (30A) along circuit 2037 (RD). Fused battery voltage is then provided to the ignition switch from BJB fuse 1 (30A) along circuit 1050 (LG/VT). The ignition switch then provides power to the Central Junction Box (CJB), the Driver Door Module (DDM) and the Lighting Control Module (LCM) through several different circuits depending on the ignition switch state of operation. The ignition switch has 4 possible states of operation:

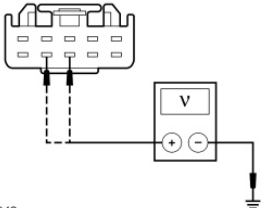
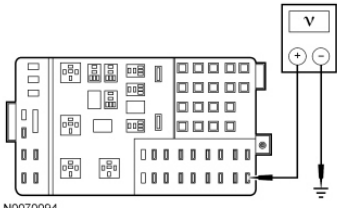
- OFF - No power on any circuits
- ACC - Power on circuit 296 (WH/VT)
- RUN - Power on circuits:
  - ◆ 296 (WH/VT)
  - ◆ 687 (GY/YE)
  - ◆ 1717 (VT/OG)
- START - Power on circuits:
  - ◆ 1522 (DG)
  - ◆ 1717 (VT/OG)

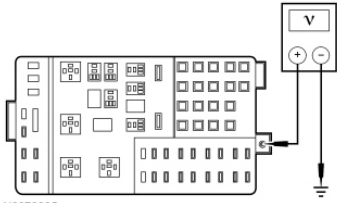
**This pinpoint test is intended to diagnose the following:**

- Fuse(s)
- Wiring, terminals or connectors
- Ignition switch

**PINPOINT TEST A: NO POWER IN ALL IGNITION SWITCH POSITIONS**

**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>A1 CHECK THE IGNITION SWITCH FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Ignition Switch C250</li> <li>• Measure the voltage between ground and: <ul style="list-style-type: none"> <li>♦ ignition switch C250-8, circuit 1050 (LG/VT), harness side.</li> <li>♦ ignition switch C250-9, circuit 1050 (LG/VT), harness side.</li> </ul> </li> </ul>  <p>N0025948</p> <ul style="list-style-type: none"> <li>• Are the voltages greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new ignition switch. REFER to <u>Ignition Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK BJB FUSE 1 (30A) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between BJB fuse 1 (30A), input side and ground.</li> </ul>  <p>N0070094</p>	<p><b>Yes</b> VERIFY BJB fuse 1 (30A) is OK. If OK, REPAIR circuit 1050 (LG/VT). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A3</u> .</p>

<ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<b>A3 CHECK THE BJB FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between BJB C1035 eyelet, circuit 2037 (RD), and ground.</li> </ul>  <p>N0070095</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new BJB . TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 2037 (RD). TEST the system for normal operation.</p>

**Pinpoint Test B: No Power in RUN/ACC**

Refer to Wiring Diagrams Cell 13 , Power Distribution for schematic and connector information.

**Normal Operation**

When placed in the RUN position, the ignition switch provides fused battery voltage to the following circuits:

- 296 (WH/VT)
- 687 (GY/YE)
- 1717 (VT/OG)

When placed in the ACC position, the ignition switch provides fused battery voltage to circuit 296 (WH/VT).

- DTC B1359 (Ignition RUN/ACC Circuit Failure) - If during the on-demand self test, the Lighting Control Module (LCM) detects an open circuit or a short to ground in the RUN or ACC circuits, DTC B1359 will be set.

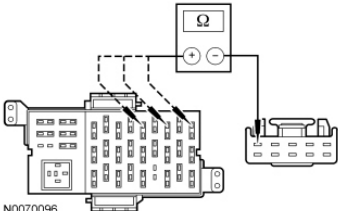
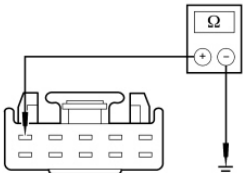
**This pinpoint test is intended to diagnose the following:**

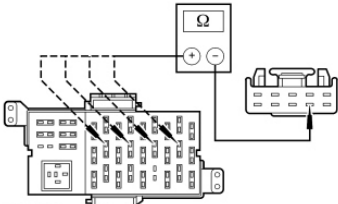
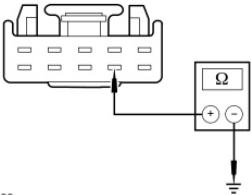
- Fuse(s)
- Wiring, terminals or connectors
- Ignition switch
- Central Junction Box (CJB)

**PINPOINT TEST B: NO POWER IN RUN/ACC**

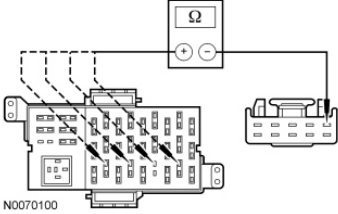
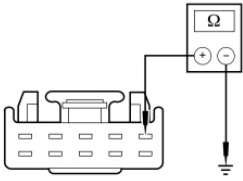
**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
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<b>B1 CHECK THE IGNITION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Carry out the Ignition Switch - Electrical Component Test.</li> <li>• <b>Is the ignition switch OK?</b></li> </ul>	<p><b>Yes</b> GO to <b>B2</b> .</p> <p><b>No</b> INSTALL a new ignition switch. REFER to <u>Ignition Switch</u> in this section. CLEAR the DTC. TEST the system for normal operation.</p>
<b>B2 CHECK CIRCUIT 296 (WH/VT) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 5 (7.5A).</li> <li>• Disconnect: CJB Fuse 7 (10A).</li> <li>• Disconnect: CJB Fuse 9 (7.5A).</li> <li>• Measure the resistance between ignition switch C250-5, circuit 296 (WH/VT), harness side and: <ul style="list-style-type: none"> <li>◆ CJB fuse 5 (7.5A), circuit 296 (WH/VT), input side.</li> <li>◆ CJB fuse 7 (10A), circuit 296 (WH/VT), input side.</li> <li>◆ CJB fuse 9 (7.5A), circuit 296 (WH/VT), input side.</li> </ul> </li> </ul>  <p>N0070096</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <b>B3</b> .</p> <p><b>No</b> VERIFY CJB fuses 5 (7.5A), 7 (10A) and 9 (7.5A) are OK. If OK, REPAIR circuit 296 (WH/VT). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<b>B3 CHECK CIRCUIT 296 (WH/VT) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ignition switch C250-5, circuit 296 (WH/VT), harness side and ground.</li> </ul>  <p>N0070097</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <b>B4</b> .</p> <p><b>No</b> REPAIR circuit 296 (WH/VT). TEST the system for normal operation.</p>
<b>B4 CHECK CIRCUIT 687 (GY/YE) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 11 (15A).</li> <li>• Disconnect: CJB Fuse 13 (10A).</li> <li>• Disconnect: CJB Fuse 15 (10A).</li> <li>• Disconnect: CJB Fuse 17 (10A).</li> <li>• Measure the resistance between ignition switch C250-7, circuit 687 (GY/YE), harness side and:             <ul style="list-style-type: none"> <li>◆ CJB fuse 11 (15A), circuit 687 (GY/YE), input side.</li> <li>◆ CJB fuse 13 (10A), circuit 687 (GY/YE), input side.</li> <li>◆ CJB fuse 15 (10A), circuit 687 (GY/YE), input side.</li> <li>◆ CJB fuse 17 (10A), circuit 687 (GY/YE), input side.</li> </ul> </li> </ul>  <p>N0070098</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B5</b> .</p> <p><b>No</b> VERIFY CJB fuses 11 (15A), 13 (10A), 15 (10A) and 17 (10A) are OK. If OK, REPAIR circuit 687 (GY/YE). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<p><b>B5 CHECK CIRCUIT 687 (GY/YE) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ignition switch C250-7, circuit 687 (GY/YE), harness side and ground.</li> </ul>  <p>N0070099</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B6</b> .</p> <p><b>No</b> REPAIR circuit 687 (GY/YE). TEST the system for normal operation.</p>
<p><b>B6 CHECK CIRCUIT 1717 (VT/OG) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 20 (10A).</li> <li>• Disconnect: CJB Fuse 22 (10A).</li> <li>• Disconnect: CJB Fuse 24 (10A).</li> <li>• Disconnect: CJB Fuse 26 (10A).</li> <li>• Measure the resistance between ignition switch C250-1, circuit 1717 (VT/OG), harness side and:</li> </ul>	<p><b>Yes</b> GO to <b>B7</b> .</p> <p><b>No</b> VERIFY CJB fuses 20 (10A), 22 (10A), 24 (10A) and 26 (10A) are OK. If OK, REPAIR circuit 1717 (VT/OG). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system</p>



<ul style="list-style-type: none"> <li>◆ CJB fuse 20 (10A), circuit 1717 (VT/OG), input side.</li> <li>◆ CJB fuse 22 (10A), circuit 1717 (VT/OG), input side.</li> <li>◆ CJB fuse 24 (10A), circuit 1717 (VT/OG), input side.</li> <li>◆ CJB fuse 26 (10A), circuit 1717 (VT/OG), input side.</li> </ul>  <p>N0070100</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p>for normal operation.</p>
<p><b>B7 CHECK CIRCUIT 1717 (VT/OG) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ignition switch C250-1, circuit 1717 (VT/OG), harness side and ground.</li> </ul>  <p>N0070101</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 1717 (VT/OG). TEST the system for normal operation.</p>

### Pinpoint Test C: No Power in RUN/START

Refer to Wiring Diagrams Cell 13 , Power Distribution for schematic and connector information.

#### Normal Operation

When placed in the RUN position, the ignition switch provides fused battery voltage to the following circuits:

- 296 (WH/VT)
- 687 (GY/YE)
- 1717 (VT/OG)

When placed in the START position, the ignition switch provides fused battery voltage to the following circuits:

- 1522 (DG)

- 1717 (VT/OG)
- DTC C1555 (RUN/START Input Circuit Failure) - If during the on-demand self test, the Lighting Control Module (LCM) detects an open circuit or a short to ground in the RUN or START circuits, DTC C1555 will be set.

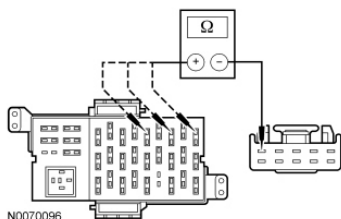
**This pinpoint test is intended to diagnose the following:**

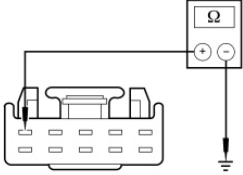
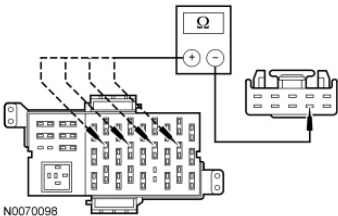
- Fuse(s)
- Wiring, terminals or connectors
- Ignition switch
- Central Junction Box (CJB)

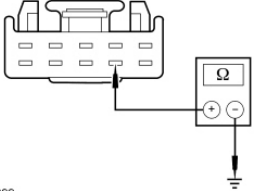
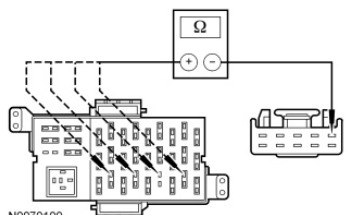
#### PINPOINT TEST C: NO POWER IN RUN/START

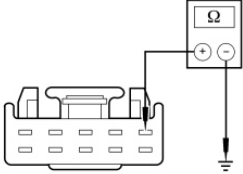
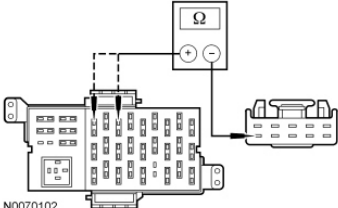
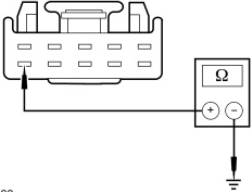
**NOTICE:** Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

Test Step	Result / Action to Take
<b>C1 CHECK THE IGNITION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Carry out the Ignition Switch - Electrical Component Test.</li> <li>• <b>Is the ignition switch OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> INSTALL a new ignition switch. REFER to <u>Ignition Switch</u> in this section. CLEAR the DTC. TEST the system for normal operation.</p>
<b>C2 CHECK CIRCUIT 296 (WH/VT) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Central Junction Box (CJB) Fuse 5 (7.5A).</li> <li>• Disconnect: CJB Fuse 7 (10A).</li> <li>• Disconnect: CJB Fuse 9 (7.5A).</li> <li>• Measure the resistance between ignition switch C250-5, circuit 296 (WH/VT), harness side and: <ul style="list-style-type: none"> <li>◆ CJB fuse 5 (7.5A), circuit 296 (WH/VT), input side.</li> <li>◆ CJB fuse 7 (10A), circuit 296 (WH/VT), input side.</li> <li>◆ CJB fuse 9 (7.5A), circuit 296 (WH/VT), input side.</li> </ul> </li> </ul>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> VERIFY CJB fuses 5 (7.5A), 7 (10A) and 9 (7.5A) are OK. If OK, REPAIR circuit 296 (WH/VT). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>



<ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>C3 CHECK CIRCUIT 296 (WH/VT) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ignition switch C250-5, circuit 296 (WH/VT), harness side and ground.</li> </ul>  <p>N0070097</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C4</u> .</p> <p><b>No</b> REPAIR circuit 296 (WH/VT). TEST the system for normal operation.</p>
<b>C4 CHECK CIRCUIT 687 (GY/YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 11 (15A).</li> <li>• Disconnect: CJB Fuse 13 (10A).</li> <li>• Disconnect: CJB Fuse 15 (10A).</li> <li>• Disconnect: CJB Fuse 17 (10A).</li> <li>• Measure the resistance between ignition switch C250-7, circuit 687 (GY/YE), harness side and:             <ul style="list-style-type: none"> <li>◆ CJB fuse 11 (15A), circuit 687 (GY/YE), input side.</li> <li>◆ CJB fuse 13 (10A), circuit 687 (GY/YE), input side.</li> <li>◆ CJB fuse 15 (10A), circuit 687 (GY/YE), input side.</li> <li>◆ CJB fuse 17 (10A), circuit 687 (GY/YE), input side.</li> </ul> </li> </ul>  <p>N0070098</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C5</u> .</p> <p><b>No</b> VERIFY CJB fuses 11 (15A), 13 (10A), 15 (10A) and 17 (10A) are OK. If OK, REPAIR circuit 687 (GY/YE). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<b>C5 CHECK CIRCUIT 687 (GY/YE) FOR A SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between ignition switch C250-7, circuit 687 (GY/YE), harness side and ground.</li> </ul>  <p>N0070099</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C6</u> .</p> <p><b>No</b> REPAIR circuit 687 (GY/YE). TEST the system for normal operation.</p>
<p><b>C6 CHECK CIRCUIT 1717 (VT/OG) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 20 (10A).</li> <li>• Disconnect: CJB Fuse 22 (10A).</li> <li>• Disconnect: CJB Fuse 24 (10A).</li> <li>• Disconnect: CJB Fuse 26 (10A).</li> <li>• Measure the resistance between ignition switch C250-1, circuit 1717 (VT/OG), harness side and:             <ul style="list-style-type: none"> <li>♦ CJB fuse 20 (10A), circuit 1717 (VT/OG), input side.</li> <li>♦ CJB fuse 22 (10A), circuit 1717 (VT/OG), input side.</li> <li>♦ CJB fuse 24 (10A), circuit 1717 (VT/OG), input side.</li> <li>♦ CJB fuse 26 (10A), circuit 1717 (VT/OG), input side.</li> </ul> </li> </ul>  <p>N0070100</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C7</u> .</p> <p><b>No</b> VERIFY CJB fuses 20 (10A), 22 (10A), 24 (10A) and 26 (10A) are OK. If OK, REPAIR circuit 1717 (VT/OG). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<p><b>C7 CHECK CIRCUIT 1717 (VT/OG) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ignition switch C250-1, circuit 1717 (VT/OG), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b> REPAIR circuit 1717 (VT/OG). TEST the system for normal operation.</p>

 <p>N0070101</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<p><b>C8 CHECK CIRCUIT 1522 (DG) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 1 (10A).</li> <li>• Disconnect: CJB Fuse 3 (5A).</li> <li>• Measure the resistance between the ignition switch C250-10, circuit 1522 (DG), harness side and: <ul style="list-style-type: none"> <li>◆ CJB fuse 1 (10A), circuit 1522 (DG), input side.</li> <li>◆ CJB fuse 3 (5A), circuit 1522 (DG), input side.</li> </ul> </li> </ul>  <p>N0070102</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C9</u> .</p> <p><b>No</b> VERIFY CJB fuse 1 (10A) and 3 (5A) are OK. If OK, REPAIR circuit 1522 (DG). CLEAR the DTCs. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. TEST the system for normal operation.</p>
<p><b>C9 CHECK CIRCUIT 1522 (DG) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the ignition switch C250-10, circuit 1522 (DG), harness side and ground.</li> </ul>  <p>N0070103</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 1522 (DG). CLEAR the DTCs. TEST the system for normal operation.</p>

## Component Tests

### Ignition Switch - Mechanical

The following conditions can cause difficulty in operating the ignition switch and lock cylinder:

- Burrs on the lock cylinder key
- Insufficient lube on the lock cylinder
- Binding lock cylinder
- Burrs or foreign material around the rack-and-pinion actuator in the lock cylinder housing
- Insufficient lube on the actuator (Do not apply lubricant to the inside of the ignition switch.)
- Binding ignition switch

Carry out the following test to determine if the ignition switch and lock cylinder are operating correctly.

1. Inspect the ignition key for any burrs, damage or incorrect cut. If the ignition key is damaged, a new one must be made.
2. Turn the key to the ACC position and then the RUN position.
  - If the ignition key turns to the ACC and RUN position, continue with Step 3.
  - If the ignition key will not turn to the ACC and RUN position, continue with Step 4.
3. **NOTE:** The ignition switch and lock cylinder should return from the START position back to the RUN position without assistance.

Turn the ignition key to the START position and release the key.

- If the ignition switch and lock cylinder return from the START position back to the RUN position without assistance, the ignition switch is operating correctly at this time.
  - If the ignition switch and lock cylinder do not return from the START position back to the RUN position without assistance, continue with Step 4.
4. Remove the ignition lock cylinder. Refer to Section 501-14 .
  5. Rotate the ignition lock cylinder through all of the switch positions.
    - If the lock cylinder operates correctly, continue with Step 6.
    - If the lock cylinder does not operate correctly, install a new ignition lock cylinder. Refer to Section 501-14 .
  6. Check for binding or sticking ignition switch actuating rod, burrs around the rack-and-pinion actuator in the ignition lock cylinder housing or insufficient lubrication.
    - If there is sufficient lubrication and there are no burrs, binding or sticking conditions, install a new ignition switch. Refer to Ignition Switch in this section.
    - If there is insufficient lubrication, burrs, binding or sticking conditions, repair or lubricate as necessary.

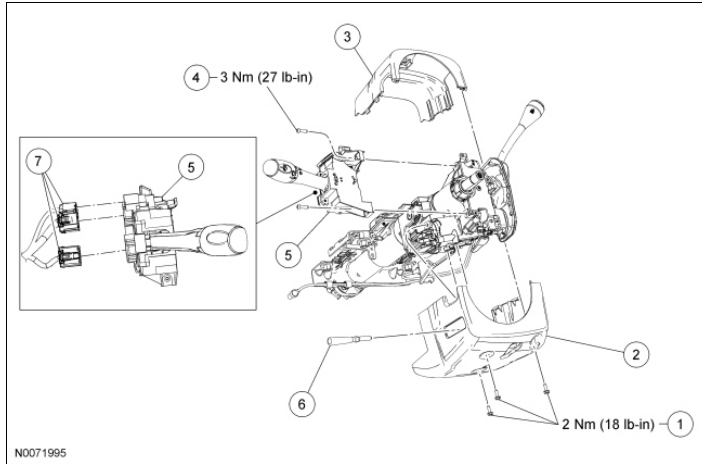
### Ignition Switch - Electrical

Refer to Wiring Diagrams Cell 149 for component testing.

### Multifunction Switch - Electrical

Refer to Wiring Diagrams Cell 149 for component testing.



**Steering Column Multifunction Switch****NOTE:** Steering wheel removed for clarity.

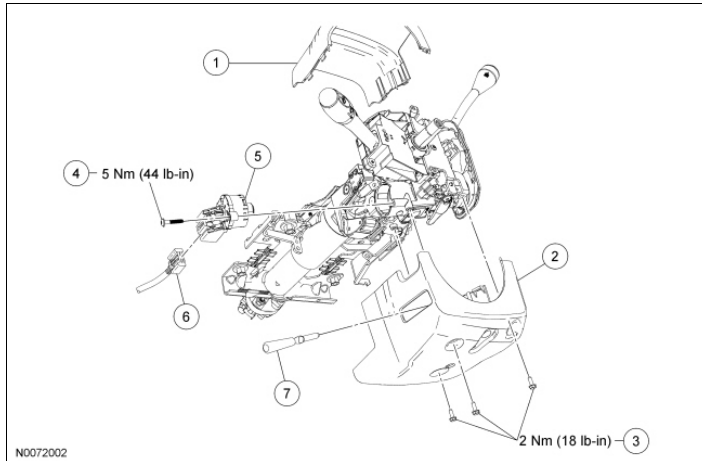
Item	Part Number	Description
1	55929	Lower steering column shroud screws (3 required)
2	3530	Lower steering column shroud
3	3530	Upper steering column shroud
4	390345	Multifunction switch screw (2 required)
5	13K359	Multifunction switch
6	3F609	Steering column tilt release lever/handle
7	-	Multifunction switch electrical connectors (part of 14401) (3 required)

**Removal and Installation**

1. Remove the steering column tilt release lever/handle.
2. **NOTE:** Release the upper steering column shroud by pressing the sides inward.  
Remove the 3 screws and the upper and lower steering column shrouds.
  - To install, tighten to 2 Nm (18 lb-in).
3. Disconnect the 3 multifunction switch electrical connectors.
4. Remove the 2 screws and the multifunction switch.
  - To install, tighten to 3 Nm (27 lb-in).
5. To install, reverse the removal procedure.

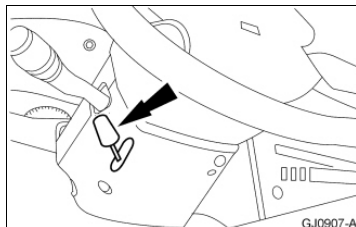




**Ignition Switch****Removal and Installation****NOTE:** Steering wheel removed for clarity.

Item	Part Number	Description
1	3530	Upper steering column shroud
2	3530	Lower steering column shroud
3	W710485	Lower steering column shroud screws (3 required)
4	118572	Ignition switch screw
5	11572	Ignition switch
6	-	Ignition switch electrical connector (part of 14401)
7	3F609	Steering column tilt release lever/handle

1. Depower the Supplemental Restraint System (SRS) For additional information, refer to [Section 501-20B](#).
2. Remove the steering column tilt release lever/handle.



3. **NOTE:** Release the upper steering column shroud by pressing the sides inward.

Remove the 3 screws and the upper and lower steering column shrouds.

- To install, tighten to 2 Nm (18 lb-in).

4. Remove the ignition switch.
  1. Disconnect the electrical connector.

2. Remove the ignition switch screw and remove the ignition switch.
    - ◆ To install, tighten to 5 Nm (44 lb-in).
  5. To install, reverse the removal procedure.
  6. Repower the SRS . For additional information, refer to Section 501-20B .
-

SECTION 412-00: Climate Control System - General  
Information and Diagnostics  
SPECIFICATIONS

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

## Material

Item	Specification	Fill Capacity
Motorcraft® A/C Cooling Coil Coating YN-29	-	-
Motorcraft® A/C System Flushing Solvent YN-23	-	-
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B	207 ml (7 fl oz)
Motorcraft® R-134a Refrigerant YN-19 (US); CYN-16-R (Canada)	WSH-M17B19-A	0.77 kg (27 oz) (1.7 lb)
Stay-Brite® R-134a Leak Detection Dye 164-R6060 (Rotunda)	-	-

## General Specifications

Item	Specification
<b>A/C Compressor</b>	
Type	FS18
<b>A/C Compressor Magnetic Clutch</b>	
Air gap clearance	0.35-0.65 mm (0.014-0.026 in)
<b>A/C Cycling Switch</b>	
Open pressure	159 kPa (23 psi)
Close pressure	290 kPa (42 psi)
<b>A/C Pressure Relief Valve <sup>a</sup></b>	
Open pressures	3,432-4,138 kPa (498-600 psi)
<b>Evaporator Core Orifice</b>	
Color	Orange
Diameter	1.45 mm (0.057 in)
<b>Refrigerant System Dye</b>	
R-134a Leak Detection Dye 164-R6060 or 164-R6081	-

<sup>a</sup> Manifold gauge set pressures may vary slightly depending on the distance between the service gauge port valve and the A/C pressure relief valve or low charge protection switch.



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**Climate Control System**

**⚠ WARNING:** Take the following precautions when repairing an air conditioning system containing R-134a:

- ◆ Always wear safety goggles.
- ◆ Avoid contact with liquid refrigerant R-134a. R-134a vaporizes at approximately -25°C (-13°F) under atmospheric pressure and will freeze skin tissue.
- ◆ Never allow refrigerant R-134a gas to escape in quantity in an occupied space. It will displace the oxygen needed to support life.
- ◆ Never use a torch in an atmosphere containing R-134a gas. R-134a is non-toxic at all normal conditions, but it decomposes when exposed to high temperatures such as a torch flame. During decomposition it releases irritating and toxic gasses (as described in the MSDS sheet from the manufacturer). Decomposition products are hydrofluoric acid, carbon dioxide and water.

Failure to follow these instructions may result in serious personal injury.

**NOTICE:** To avoid damaging the vehicle or Air Conditioning (A/C) components, the following precautions must be observed.

- The A/C refrigerant of all vehicles must be identified and analyzed prior to refrigerant charging. Failure to do so can contaminate the shop bulk refrigerant and other vehicles.
- Do not add R-12 refrigerant to an A/C system that requires the use of R-134a refrigerant. These 2 types of refrigerant must never be mixed. Doing so can damage the A/C system.
- Charge the A/C system with the engine running only at the low-pressure side to prevent refrigerant slugging from damaging the A/C compressor.
- Use only R-134a refrigerant. Due to environmental concerns, when the A/C system is drained, the refrigerant must be collected using refrigerant recovery/recycling equipment. Federal, State/Provincial and/or local laws REQUIRE that R-134a be recovered into appropriate recovery equipment and the process be conducted by qualified technicians who have been certified by an approved organization, such as Automotive Service Excellence (ASE) or Mobile Air Conditioning Society (MACS). Use of a recovery machine dedicated to R-134a is necessary to reduce the possibility of oil and refrigerant incompatibility concerns. Refer to the instructions provided by the equipment manufacturer when removing refrigerant from or charging the A/C system.
- Refrigerant R-134a must not be mixed with air for leak testing or used with air for any other purpose above atmospheric pressure. R-134a is combustible when mixed with high concentrations of air and higher pressures.
- A number of manufacturers are producing refrigerant products that are described as direct substitutes for refrigerant R-134a. The use of any unauthorized substitute refrigerant can severely damage the A/C components. If repair is required, use only new or recycled refrigerant R-134a.

**NOTICE:** To avoid contamination of the Air Conditioning (A/C) system, observe the following precautions:

- Never open or loosen a connection before recovering the refrigerant using approved equipment.
- When loosening a connection, if any residual pressure is evident, allow it to leak out before opening the fitting.
- Evacuate a system that has been opened to install a component or one that has discharged through leakage before charging.
- Seal open fittings with a cap or plug immediately after disconnecting a component from the system.

- Clean the outside of the fittings thoroughly before disconnecting a component from the system.
- Do not remove the sealing caps from a new component until ready to install.
- Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open an oil container until ready to use, and install the cap immediately after using. Store the oil in a clean, moisture-free container.
- Install a new O-ring seal before connecting an open fitting. Coat the fitting and O-ring seal with refrigerant oil before connecting.
- When installing a refrigerant line, avoid sharp bends. Position the line away from the exhaust or any sharp edges that can chafe the line.
- Tighten threaded fittings only to specification. The steel and aluminum fittings used in the refrigerant system will not tolerate overtightening.
- When disconnecting a fitting, use a wrench on both halves of the fitting to prevent twisting of the refrigerant lines or tubes.
- Do not open a refrigerant system or uncap a new component unless it is as close as possible to room temperature. This will prevent condensation from forming inside a component that is cooler than the surrounding air.

The manual climate control system heats or cools the vehicle depending on the function selector switch position and the temperature selected.

- The function selector switch position determines heating or cooling and air distribution.
- The temperature control setting determines the air temperature.
- The heater blower motor switch varies the blower motor speed.

The Electronic Automatic Temperature Control (EATC) system maintains the selected vehicle interior temperature by heating or cooling the air.

- During A/C operation, the system also reduces the relative humidity of the air.
- The driver may override the automatic mode of operation.

The system components are the following:

- A/C compressor
- A/C compressor clutch assembly
- A/C condenser core
- A/C evaporator core
- Suction accumulator
- Connecting refrigerant lines
- A/C evaporator core orifice
- A/C cycling switch
- A/C pressure cutoff switch
- Heater core and evaporator core housing
- HVAC module
- Manual climate control assembly
- Blower switch (manual system)
- Temperature blend door actuator
- Blower motor resistor or speed control module
- Blower motor
- Ambient temperature sensor
- In-vehicle temperature sensor
- Solar radiation sensor

### **External Temperature Display**

When the ignition is first turned ON, the external temperature displayed will be the last temperature read before the ignition was turned OFF. If the last temperature read is below 2°C (35°F), the HVAC module will prevent A/C operation.

The external temperature display will update when the vehicle has been driven above 40 km/h (25 mph) for greater than 30 seconds. Once the HVAC module updates the external temperature, the HVAC module will allow normal A/C operation.

### **System Air Flow Description - Manual Climate Control**

#### **MAX A/C**

When MAX A/C is selected:

- The air inlet door vacuum control motor is at full vacuum, closing off outside air and admitting only recirculated air.
- The panel door and floor/defrost door vacuum control motors are at full vacuum, directing airflow to the instrument panel A/C registers.
- Blended air temperature is available.
- The A/C compressor will operate if the outside temperature is above approximately 4°C (39°F).
- The blower motor is ON.

#### **NORM A/C**

When NORM A/C is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel door and floor/defrost door vacuum control motors are at full vacuum, directing airflow to the instrument panel A/C registers.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
- The blower motor is ON.

#### **VENT**

When VENT is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel door and floor/defrost door vacuum control motors are at full vacuum, directing airflow to the instrument panel A/C registers.
- The temperature can be adjusted to heat the air, but air cannot be cooled below outside temperature.
- The A/C compressor will not operate.
- The blower motor is ON.

#### **OFF**

When OFF is selected:

- The air inlet door vacuum control motor is at full vacuum, closing off outside air from entering the passenger compartment.
- The floor/defrost door vacuum control motor is at full vacuum and the panel door vacuum control



motor is at no vacuum, closing off airflow to the defrost duct, side window demisters and instrument panel A/C registers.

- The A/C compressor will not operate.
- The blower motor is OFF.

## **FLOOR**

When FLOOR is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The floor/defrost door vacuum control motor is at full vacuum and the panel door vacuum control motor is at no vacuum, directing airflow to the floor duct.
- The temperature can be adjusted to heat the air, but air cannot be cooled below the outside temperature.
- The A/C compressor will not operate.
- The blower motor is ON.

## **MIX**

When MIX is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The floor/defrost door vacuum control motor is at partial vacuum and the panel door vacuum control motor is at no vacuum, directing airflow to the floor duct, the defroster duct and the side window demisters.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
- The blower motor is ON.

## **DEFROST**

When DEFROST is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The floor/defrost door vacuum control motor and the panel door vacuum control motors are at no vacuum, directing airflow to the defroster duct and the side window demisters.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
- The blower motor is ON.

## **System Airflow Description - Electronic Automatic Temperature Control (EATC)**

### **AUTOMATIC**

When AUTOMATIC is selected:

**NOTE:** If conditions require heat, until the engine is at operating temperature, the blower motor will operate in low and airflow will be directed to the defroster ducts.

- The air inlet door vacuum control motor is automatically controlled depending on airflow location and

desired temperature.

- The panel door and floor/defrost door vacuum control motors are automatically controlled depending on desired temperature.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
- Blower motor speed is automatically controlled. If the fan speed override button is pressed in AUTOMATIC mode, the fan speed will no longer be automatically controlled.

## **MAX A/C**

When MAX A/C is selected:

- The air inlet door vacuum control motor is at full vacuum, closing off outside air and admitting only recirculated air.
- The panel door and floor/defrost door vacuum control motors are at full vacuum, directing airflow to the instrument panel A/C registers.
- Blended air temperature is available.
- The A/C compressor will operate if the outside temperature is above approximately 4°C (39°F).
- The blower motor is ON.

## **NORM A/C**

When NORM A/C is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel door and floor/defrost door vacuum control motors are at full vacuum, directing airflow to the instrument panel A/C registers.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
- The blower motor is ON.

## **VENT**

When VENT is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The panel door and floor/defrost door vacuum control motors are at full vacuum, directing airflow to the instrument panel A/C registers.
- The temperature can be adjusted to heat the air, but air cannot be cooled below outside temperature.
- The A/C compressor will not operate.
- The blower motor is ON.

## **OFF**

When OFF is selected:

- The air inlet door vacuum control motor is at full vacuum, closing off outside air from entering the passenger compartment.
- The floor/defrost door vacuum control motor is at full vacuum and the panel door vacuum control motor is at no vacuum, closing off airflow to the defrost duct, side window demisters and instrument panel A/C registers.
- The A/C compressor will not operate.

- The blower motor is OFF.

## **FLOOR**

When FLOOR is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The floor/defrost door vacuum control motor is at full vacuum and the panel door vacuum control motor is at no vacuum, directing airflow to the floor duct.
- The temperature can be adjusted to heat the air, but air cannot be cooled below the outside temperature.
- The A/C compressor will not operate.
- The blower motor is ON.

## **FLOOR/DEFROST**

When FLOOR/DEFROST is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
- The floor/defrost door vacuum control motor is at partial vacuum and the panel door vacuum control motor is at no vacuum, directing airflow to the floor duct, the defroster duct and the side window demisters.
- Blended air temperature is available.
- The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
- The blower motor is ON.

## **DEFROST**

When DEFROST is selected:

- The air inlet door vacuum control motor is at no vacuum, admitting only outside air into the passenger compartment.
  - The floor/defrost door and panel door vacuum control motors are at no vacuum, directing airflow to the defroster duct and the side window demisters.
  - Blended air temperature is available.
  - The A/C compressor will operate if the outside air temperature is above approximately 4°C (39°F).
  - The blower motor is ON.
-












SECTION 412-00: Climate Control System - General  
Information and Diagnostics  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 10/27/2010

## Climate Control System

### Special Tool(s)

 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1474-A	Pressure Test Kit 014-R1072 or equivalent
 ST1928-A	R-134a Manifold Gauge Set 176-R032A or equivalent
 ST2351-A	Refrigerant Leak Detector 216-00001 or equivalent
 ST1252-A	Set, A/C Fittings 412-DS028 (014-00333, D93L-19703-B) or equivalent
 ST3094-A	Test Light SGT27000 or equivalent 250-300 mA incandescent bulb test lamp
 ST1176-A	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

### Principles of Operation

#### Compressor Anti-Slugging Strategy (CASS)

Liquid refrigerant may accumulate in the A/C compressor under certain conditions. To alleviate damage to the A/C compressor, Compressor Anti-Slugging Strategy (CASS) is utilized.

CASS is initiated only under specific conditions:

- the ignition is off for more than 1 hour.
- the ambient temperature is above -4°C (25°F).
- battery voltage is above 8.5 volts during engine cranking.

When these conditions are present, the PCM will activate the A/C clutch relay prior to cranking of the engine. The A/C control relay engages the A/C compressor for approximately 4-15 A/C compressor revolutions or a maximum of 2 seconds (depending upon vehicle application), allowing the liquid refrigerant to be pushed from the A/C compressor. CASS is initiated by the PCM regardless of the function selector switch position or the system settings.

### **The Refrigerant Cycle**

During stabilized conditions (A/C system shut down), the refrigerant is in a vaporized state and pressures are equal throughout the system. When the A/C compressor is in operation, it increases pressure on the refrigerant vapor, raising its temperature. The high-pressure and high-temperature vapor is then released into the top of the A/C condenser core.

The A/C condenser core, being close to ambient temperature, causes the refrigerant vapor to condense into a liquid when heat is removed from the refrigerant by ambient air passing over the fins and tubing. The now liquid refrigerant, still at high pressure, exits from the bottom of the A/C condenser core and enters the inlet side of the A/C evaporator core orifice.

The A/C evaporator core orifice is the restriction in the refrigerant system that creates the high-pressure buildup upstream of the A/C condenser core and separates the high- and low-pressure sides of the A/C system. As the liquid refrigerant leaves this restriction, its pressure and boiling point are reduced.

The liquid refrigerant is now at its lowest pressure and temperature. As it passes through the A/C evaporator core, it absorbs heat from the passenger compartment airflow passing over the plate/fin sections of the A/C evaporator core. This addition of heat causes the refrigerant to boil (convert to gas). The now cooler passenger compartment air can no longer support the same humidity level of the warmer air and this excess moisture condenses on the exterior of the evaporator coils and fins and drains outside the vehicle.

The suction accumulator/drier is designed to remove moisture from the refrigerant and to prevent any liquid refrigerant that may not have been vaporized in the evaporator core from reaching the A/C compressor. The A/C compressor is designed to pump refrigerant vapor only, as liquid refrigerant will not compress and can damage the A/C compressor.

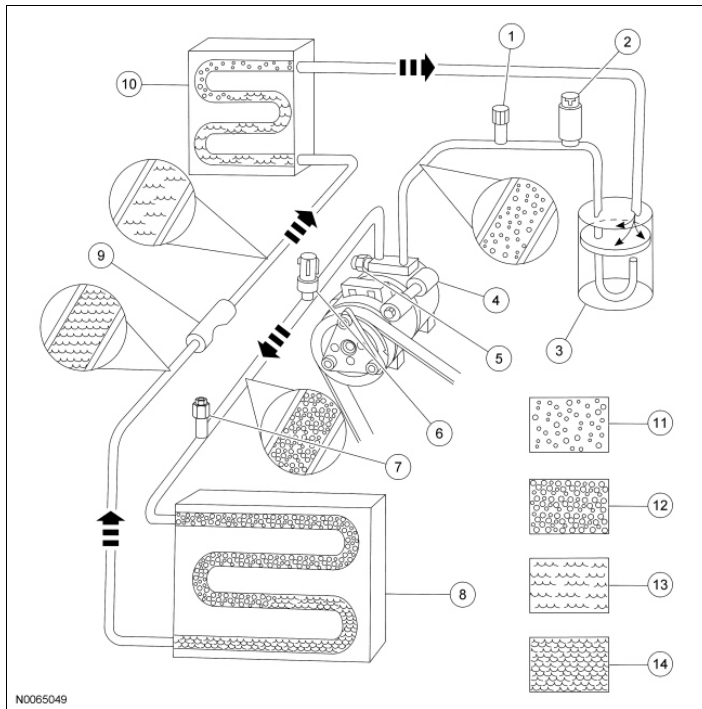
The refrigerant cycle is now repeated with the A/C compressor, again increasing the pressure and temperature of the refrigerant.

The A/C cycling switch interrupts compressor operation before the external temperature of the evaporator core gets low enough to cause the condensed water vapor (excess humidity) to turn to ice. It does this by monitoring low side line pressure. It is known that a refrigerant pressure of approximately 210 kPa (30 psi) will yield an operating temperature of 0°C (32°F). The A/C cycling switch controls system operation in an effort to maintain this temperature.

The high side line pressure is also monitored so that A/C compressor operation can be interrupted if system pressure becomes too high.

The A/C compressor relief valve will open and vent refrigerant to relieve unusually high system pressure.

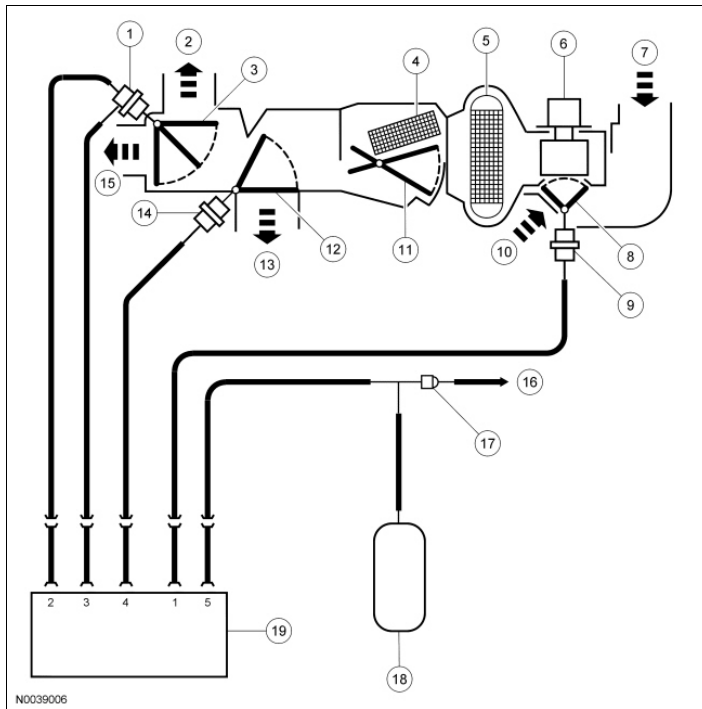
### **Clutch Cycling Orifice Tube Type Refrigerant System**



Item	Description
1	A/C charge valve port (low side)
2	A/C cycling switch
3	Suction accumulator
4	A/C compressor
5	A/C compressor pressure relief valve
6	A/C pressure transducer
7	A/C charge valve port (high side)
8	Condenser core
9	Evaporator core orifice tube
10	Evaporator core
11	Low-pressure vapor
12	High-pressure vapor
13	Low-pressure liquid
14	High-pressure liquid

## Vacuum System

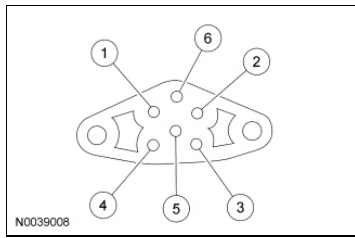
### Vacuum Schematic - Manual A/C



Item	Part Number	Description
1	18A318	Vacuum control motor - floor/defrost door
2	-	Defrost airflow
3	18A478	Floor/defrost door
4	18476	Heater core
5	19860	Evaporator core
6	19805	Blower motor
7	-	Outside air inlet
8	19A813	Air inlet door
9	18A318	Vacuum control motor - air inlet door
10	-	Recirculated air inlet
11	18B545	Temperature blend door
12	18A559	Panel door
13	-	Panel airflow
14	18A318	Vacuum control motor - panel door
15	-	Floor airflow
16	-	Vacuum from the engine intake manifold
17	19A563	A/C vacuum check valve
18	19A566	Vacuum reservoir tank and bracket
19	19B888	Function selector switch

#### Vacuum Connector End View - Manual A/C





Port	Hose Color	Function
1	White	Air inlet door
2	Red	Floor door
3	Yellow	Floor/defrost door
4	Blue	Panel door
5	Black	Vacuum source
6	-	Not used

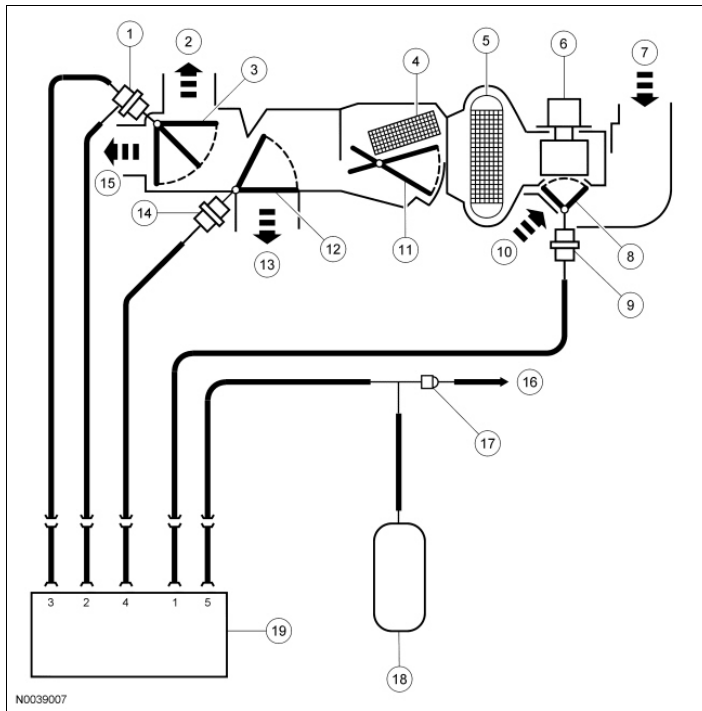
#### Vacuum Application Chart - Manual A/C

Switch Port	Color	Function	Function Selector Switch Position						
			MAX A/C	NORM A/C	VENT	OFF	FLOOR	MIX	DEF
1	White	Air inlet	V	NV	NV	V	NV	NV	NV
2	Red	Full floor	V	V	V	V	V	NV	NV
3	Yellow	Floor/ defrost	V	V	V	V	V	V	NV
4	Blue	Panel	V	V	V	NV	NV	NV	NV
5	Black	Vacuum source	V	V	V	V	V	V	V

V = Vacuum

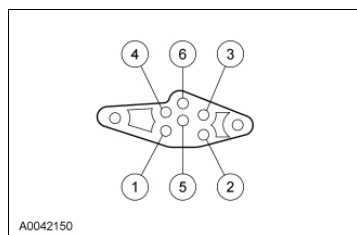
NV = No Vacuum

#### Vacuum Schematic - Electronic Automatic Temperature Control (EATC)



Item	Part Number	Description
1	18A318	Vacuum control motor - floor/defrost door
2	-	Defrost airflow
3	18A478	Floor/defrost door
4	18476	Heater core
5	19860	Evaporator core
6	19805	Blower motor
7	-	Outside air inlet
8	19A813	Air inlet door
9	18A318	Vacuum control motor - air inlet door
10	-	Recirculated air inlet
11	18B545	Temperature blend door
12	18A559	Panel door
13	-	Panel airflow
14	18A318	Vacuum control motor - panel door
15	-	Floor airflow
16	-	Vacuum from the engine intake manifold
17	19A563	A/C vacuum check valve
18	19A566	Vacuum reservoir tank and bracket
19	19980	HVAC module

#### Vacuum Connector End View - Electronic Automatic Temperature Control (EATC)



Item	Part Number	Description
1	White	Air inlet door
2	Yellow	Floor/defrost door
3	Red	Floor door
4	Blue	Panel door
5	Black	Source vacuum
6	-	Not used

### Vacuum Application Chart - EATC

Switch Port	Color	Function	Manual Override Selector Buttons						
			MAX A/C	NORM A/C	VENT	OFF	FLOOR	MIX	DEF
1	White	Air inlet	V	NV	NV	V	NV	NV	NV
2	Yellow	Floor/panel partial	V	V	V	V	V	V	NV
3	Red	Full floor	V	V	V	V	V	NV	NV
4	Blue	Panel	V	V	V	NV	NV	NV	NV
5	Black	Source	V	V	V	V	V	V	V

V = Vacuum

NV = No Vacuum

### Inspection and Verification

1. Verify the customer concern by operating the climate control system to duplicate the condition.
2. Visually inspect for obvious signs of mechanical or electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Loose, missing or damaged A/C compressor drive belt</li> <li>• Loose or disconnected A/C clutch</li> <li>• Loose, misrouted or damaged vacuum lines</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 8 (10A)</li> <li>◆ 15 (10A)</li> <li>◆ 17 (10A)</li> </ul> </li> <li>• Battery Junction Box (BJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 11 (15A)</li> <li>◆ 21 (15A)</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>• Broken or leaking vacuum control motor <sup>a</sup></li> <li>• Broken or leaking refrigerant lines</li> <li>• Obstructed in-vehicle temperature sensor</li> <li>• Disconnected in-vehicle temperature aspirator hose</li> </ul>	<ul style="list-style-type: none"> <li>♦ 101 (40A)</li> <li>• Blower motor inoperative</li> <li>• A/C compressor inoperative</li> <li>• Circuitry open/shorted</li> <li>• Disconnected, loose fitting or incorrectly installed electrical connectors and pins</li> <li>• Cooling fan inoperative</li> </ul>
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<sup>a</sup> A leak in the vacuum control circuit may occur during acceleration (slow leak), may exist at all times (large leak) and may exist only when specific functions are selected (indicating a leak in that portion of the circuit). The vacuum hoses used in the passenger compartment control circuit are constructed from PVC plastic material. The vacuum hoses used in the engine compartment are constructed of Hytrel®. Because of the materials used, never pinch the vacuum hoses off during diagnosis to locate a leak. A wood golf tee can be used as a plug when it is necessary to plug one end of the vacuum hose for leak test purposes.

3. If the inspection reveals obvious concerns that can be readily identified, repair as necessary.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM .
- refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- verify the ignition key is in the ON position.
- verify the scan tool operation with a known good vehicle.
- refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the continuous DTCs and carry out the self-test diagnostics for the PCM.

9. **NOTE:** Some PCM DTCs may inhibit A/C operation. If any PCM DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart.

If the HVAC DTCs retrieved are related to the concern, go to the HVAC Module DTC Chart. If the PCM DTCs retrieved are related to the concern, go to the PCM DTC Chart. For all other DTCs, refer to Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

**PCM DTC Chart**

<b>DTC</b>	<b>Description</b>	<b>Action to Take</b>
P0532	A/C Refrigerant Pressure Sensor A Circuit Low	<u>GO to Pinpoint Test A .</u>
P0533	A/C Refrigerant Pressure Sensor A Circuit High	<u>GO to Pinpoint Test A .</u>
P0645	Air Conditioning Clutch Relay (A/CCR) Control Circuit	<u>GO to Pinpoint Test B .</u>
P1464	A/C Demand Out Of Self Test Range	If the HVAC selector was not in the OFF position, PLACE it in the OFF position, CLEAR the DTCs and REPEAT the self-test. If the DTC does not return, IGNORE the DTC and continue diagnostics. If the DTC returns, <u>GO to Pinpoint Test M .</u> <sup>a</sup>
All Other DTCs	-	REFER to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

<sup>a</sup> PCM DTC P1464 will set if the function selector is in PANEL with A/C button pressed, DEFROST or MAX A/C mode when the on-demand self test is being run.

**DTC Chart****DTC Chart**

**NOTE:** Some PCM DTCs may inhibit A/C operation. If any PCM DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart.

<b>DTC</b>	<b>EATC (Hard) Self-Test Faults</b>	<b>EATC (Intermittent) Run-Time Faults</b>	<b>Description</b>	<b>Action to Take</b>
B1249	024	025	Blend Door Failure	<u>GO to Pinpoint Test C .</u>
B1251	031	N/A	Air Temperature Internal Sensor Circuit Open	<u>GO to Pinpoint Test D .</u>
B1253	030	N/A	Air Temperature Internal Sensor Circuit Short to Ground	<u>GO to Pinpoint Test D .</u>
B1255	041	043	Air Temperature External Sensor Circuit Open	<u>GO to Pinpoint Test E .</u>
B1257	040	042	Air Temperature External Sensor Circuit Short to Ground	<u>GO to Pinpoint Test E .</u>
B1259	053	051	Solar Radiation Sensor Circuit Open	<u>GO to Pinpoint Test F .</u>
B1261	050	052		<u>GO to Pinpoint Test F .</u>

			Solar Radiation Sensor Circuit Short to Ground	
U1073	N/A	N/A	SCP Invalid or Missing Data for Engine Coolant	<p>If DTCs are present in the Instrument Cluster (IC), DIAGNOSE those codes first. CLEAR the DTCs. If the HVAC DTC returns, INSTALL a new HVAC module. REFER to <a href="#">Section 412-01</a> . TEST the system for normal operation.</p> <p>If no DTCs are present in the IC , CLEAR the DTCs. If the HVAC module DTC returns, INSTALL a new HVAC module. REFER to <a href="#">Section 412-01</a> . TEST the system for normal operation.</p>
U1341	N/A	N/A	SCP Invalid or Missing Data for Function Read Vehicle Speed	<p>If DTCs are present in the IC , DIAGNOSE those codes first. CLEAR the DTCs. If the HVAC DTC returns, INSTALL a new HVAC module. REFER to <a href="#">Section 412-01</a> . TEST the system for normal operation.</p> <p>If no DTCs are present in the IC , CLEAR the DTCs. If the HVAC module DTC returns, INSTALL a new HVAC module. REFER to <a href="#">Section 412-01</a> . TEST the system for normal operation.</p>
All Other DTCs	-	-	-	REFER to the Master DTC Chart in <a href="#">Section 419-10</a> .

### Symptom Chart - Climate Control Systems

#### Symptom Chart - Climate Control Systems

**NOTE:** Some PCM DTCs may inhibit A/C operation. If any PCM DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart.

#### ConditionPossible SourcesAction

- No communication with the HVAC module
- Fuse(s)
- Circuitry short/open
- HVAC module communication network
- REFER to [Section 418-00](#) to continue diagnosis of the communication network.
- Unable to duplicate the customer concern and no DTCs present
- HVAC system and/or related components
- [GO to Pinpoint Test G](#) .

- Incorrect/erratic direction of airflow from outlets - manual climate control
- No vacuum to the A/C control
- Function selector switch
- Vacuum hose kinked/pinched
- Airflow door binding/stuck
- Vacuum control motor
- A/C vacuum check valve
- A/C vacuum reservoir tank and bracket
- Vacuum actuator arm not connected to the door crank
- GO to Pinpoint Test H .
- Incorrect/erratic direction of airflow from outlets - EATC
- HVAC module
- No vacuum to the A/C control
- Vacuum hose kinked/pinched
- Airflow door binding/stuck
- Vacuum control motor
- A/C vacuum check valve
- A/C vacuum reservoir tank and bracket
- Vacuum actuator arm not connected to the door crank
- GO to Pinpoint Test I .
- Insufficient, erratic or no heat
- Low engine coolant level
- Engine overheating
- Plugged or partially plugged heater core
- Temperature blend door binding/stuck
- Temperature blend door actuator
- GO to Pinpoint Test J .
- The air conditioning (A/C) is inoperative
- Fuse(s)
- Circuitry short/open
- A/C cycling switch
- A/C system discharged/low charge
- A/C pressure cutoff switch
- HVAC module
- Function selector switch
- GO to Pinpoint Test K .
- Insufficient air conditioning (A/C) cooling
- Low refrigerant level
- Temperature blend door actuator
- CARRY OUT the refrigerant system tests. REFER to Refrigerant System Tests in this section. If OK,

GO to Pinpoint Test C for vehicles equipped with Electronic Automatic Temperature Control (EATC), or if equipped with manual climate control, GO to Pinpoint Test N .

- The air conditioning (A/C) is always on - A/C compressor does not cycle
- Circuitry short/open
- A/C control relay
- HVAC module
- Function selector switch
- GO to Pinpoint Test L .
- The air conditioning (A/C) is always on - A/C mode always commanded ON
- Circuitry short/open
- A/C control relay
- HVAC module
- Function selector switch
- GO to Pinpoint Test M .
- Temperature control is inoperative/does not operate correctly - manual climate control
- Temperature blend door actuator control
- Temperature blend door
- Temperature blend door actuator motor
- Circuitry open/shorted
- GO to Pinpoint Test N .
- Temperature control is inoperative/does not operate correctly - EATC
- Circuitry open/shorted
- Temperature blend door
- Temperature blend door actuator
- HVAC
- GO to Pinpoint Test C .
- Reduced outlet airflow
- Circuitry short
- A/C compressor clutch air gap
- A/C cycling switch
- A/C clutch relay
- Blower motor
- Blower motor control
- Blower motor resistor
- Blower motor switch
- PCM
- If the A/C compressor does not cycle, GO to Pinpoint Test K .
- Manual systems, if the A/C compressor cycles normally, GO to Pinpoint Test P .
- EATC systems, if the A/C compressor cycles normally, GO to Pinpoint Test R .



- The blower motor is inoperative - manual climate control
  - Fuse(s)
  - Circuitry open/shorted
  - A/C blower motor switch
  - A/C blower motor resistor
  - A/C blower motor
- GO to Pinpoint Test O .
- The blower motor does not operate correctly - manual climate control
  - Circuitry short/open
  - A/C blower motor resistor
  - A/C blower motor switch
- CARRY OUT the Blower Motor Resistor component test in this section. If the blower motor resistor tests good, GO to Pinpoint Test P .
- The blower motor is inoperative - EATC
  - Fuse(s)
  - Circuitry short/open
  - Blower motor relay
  - A/C blower motor
  - A/C blower motor speed control
- GO to Pinpoint Test Q .
- The blower motor does not operate correctly - EATC
  - Circuitry short/open
  - A/C blower motor speed control
  - HVAC module
- GO to Pinpoint Test R .
- The temperature set point does not repeat after turning the ignition switch OFF - EATC
  - Fuse(s)
  - Circuitry short/open
  - HVAC module
- VERIFY Central Junction Box (CJB) fuse 8 (10A) is OK. If OK, REPAIR circuit 1566 (RD/YE) for an open.
- The temperature display will not switch between Celsius and Fahrenheit - EATC
  - HVAC module
- PRESS the MAX A/C and DEFROST buttons simultaneously for at least 0.75 seconds. If the temperature display does not switch between Celsius and Fahrenheit, INSTALL a new HVAC module.

- Inaccurate external temperature display
- HVAC module
- REFER to Description and Operation of the HVAC External Temperature Display. If the external temperature display is not operating as described and no DTC is present, CARRY OUT the Ambient Temperature Sensor component test in this section. If the sensor tests OK, INSTALL a new HVAC module. REFER to Section 412-01 . TEST the system for normal operation.
- A/C pressure relief valve discharging
- High system pressure
- A/C pressure relief valve
- CHECK the high side system pressure. If the pressure is below the A/C pressure relief valve open pressure, REPLACE the A/C pressure relief valve. If the system pressure is above the A/C pressure relief valve open pressure, REPAIR the system for a restriction.

## Symptom Chart - NVH

### Symptom Chart - NVH

**NOTE:** NVH symptoms will be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04 . Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to Section 100-04 for the next likely system and continue diagnosis.

### ConditionPossible SourcesAction

- Noisy A/C compressor
- A/C compressor clutch air gap out of specification
- CHECK and ADJUST the A/C compressor clutch gap if necessary. REFER to Air Conditioning (A/C) Clutch Air Gap Adjustment in this section. TEST the system for normal operation.
- If the A/C compressor clutch gap is OK, INSTALL an A/C compressor clutch. REFER to Section 412-01 . TEST the system for normal operation.
- A/C compressor pulley bearing worn
- INSPECT the A/C compressor pulley bearing for roughness. If bearing roughness is found, INSTALL an A/C compressor pulley. REFER to Section 412-01 . TEST the system for normal operation.
- A/C compressor bearing worn
- INSPECT the A/C compressor bearing for roughness. If bearing roughness is found, INSTALL an A/C compressor. REFER to Section 412-01 . TEST the system for normal operation.

## Pinpoint Tests

**Pinpoint Test A: DTC P0532 or P0533**

Refer to Wiring Diagrams Cell 24 , Electronic Engine Controls - 4.6L for schematic and connector information.

**Normal Operation**

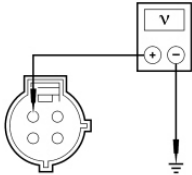
Under normal operation, the A/C pressure transducer receives a ground from the PCM. A 5-volt reference voltage is supplied to the A/C pressure transducer from the PCM. The A/C pressure transducer then sends a voltage to the PCM to indicate the A/C pressure.

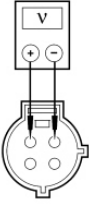
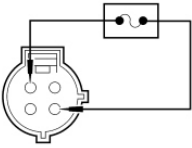
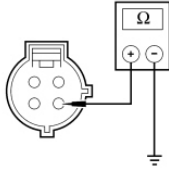
- DTC P0532 (A/C Pressure Refrigerant Sensor A Circuit Low) - The A/C pressure transducer inputs a voltage to the PCM. If the voltage is below the calibrated level, this DTC sets.
- DTC P0533 (A/C Pressure Refrigerant Sensor A Circuit High) - The A/C pressure transducer inputs a voltage to the PCM. If the voltage is above the calibrated level, this DTC sets.

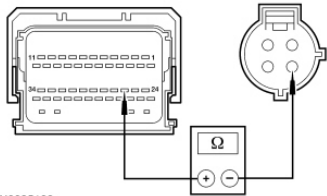
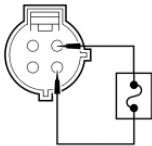
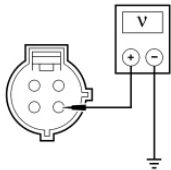
**This pinpoint test is intended to diagnose the following:**

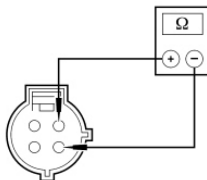
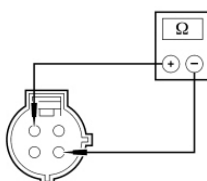
- Wiring, terminals or connectors
- A/C pressure transducer
- PCM

**PINPOINT TEST A: DTC P0532 OR P0533**

Test Step	Result / Action to Take
<b>A1 CHECK THE PCM OUTPUT VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Pressure Transducer C1260.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and A/C pressure transducer C1260-2, circuit 351 (BN/WH), harness side.</li> </ul>  <p>N0082573</p> <ul style="list-style-type: none"> <li>• Is the voltage between 4.7 and 5.1 volts?</li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> If the voltage is less than 4.7 volts, REPAIR circuit 351 (BN/WH) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p>If the voltage is greater than 5.1 volts, REPAIR circuit 351 (BN/WH) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A2 CHECK THE PCM SENSOR GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between A/C pressure transducer C1260-1, circuit 359 (GY/RD), harness side and A/C pressure transducer C1260-2, circuit 351 (BN/WH), harness side.</li> </ul>	<p><b>Yes</b> If diagnosing <b>DTC P0532</b> , GO to <u>A3</u> . If diagnosing <b>DTC P0533</b> , GO to <u>A6</u> .</p> <p><b>No</b> REPAIR circuit 359 (GY/RD) for an</p>

 <p>A0047632</p> <ul style="list-style-type: none"> <li>• Is the voltage between 4.7 and 5.1 volts?</li> </ul>	<p>open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A3 CHECK THE A/C PRESSURE TRANSDUCER HIGH</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: A/C Pressure (ACP_PRESS) PCM PID.</li> <li>• While observing the ACP_PRESS PCM PID, connect a fused jumper between A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side and A/C pressure transducer C1260-2, circuit 351 (BN/WH), harness side.</li> </ul>  <p>N0082574</p> <ul style="list-style-type: none"> <li>• Does the ACP_PRESS PCM PID voltage read greater than 4 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new A/C pressure transducer. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A4</u> .</p>
<b>A4 CHECK CIRCUIT 1154 (WH/BK) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Measure the resistance between ground and A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side.</li> </ul>  <p>A0047688</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> REPAIR circuit 1154 (WH/BK) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A5 CHECK CIRCUIT 1154 (WH/BK) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side and PCM C175B-26, circuit 1154 (WH/BK), harness side.</li> </ul>  <p>N0085102</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">A8</a> .</p> <p><b>No</b> REPAIR circuit 1154 (WH/BK) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A6 CHECK THE A/C PRESSURE TRANSDUCER HIGH</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: A/C Pressure (ACP_PRESS) PCM PID.</li> <li>• While observing the ACP_PRESS PCM PID, connect a fused jumper between A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side and A/C pressure transducer C1260-1, circuit 359 (GY/RD), harness side.</li> </ul>  <p>A0008127</p> <ul style="list-style-type: none"> <li>• <b>Does the ACP_PRESS PCM PID voltage read less than 4.9 volts?</b></li> </ul>	<p><b>Yes</b> INSTALL a new A/C pressure transducer. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <a href="#">A7</a> .</p>
<b>A7 CHECK CIRCUIT 1154 (WH/BK) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side.</li> </ul>  <p>A0047689</p>	<p><b>Yes</b> REPAIR circuit 1154 (WH/BK) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <a href="#">A7</a> .</p>

<ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	
<b>A8 CHECK CIRCUIT 1154 (WH/BK) FOR A SHORT TO CIRCUIT 351 (BN/WH) OR 359 (GY/RD)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>NOTE: For DTC P0532 only.</b></li> <li>• Measure the resistance between A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side and A/C pressure transducer C1260-1, circuit 359 (GY/RD), harness side.</li> </ul>  <p>N0082575</p> <ul style="list-style-type: none"> <li>• <b>NOTE: For DTC P0533 only.</b></li> <li>• Measure the resistance between A/C pressure transducer C1260-3, circuit 1154 (WH/BK), harness side and A/C pressure transducer C1260-2, circuit 351 (BN/WH), harness side.</li> </ul>  <p>N0082576</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A9</u>.</p> <p><b>No</b> REPAIR circuit 1154 (WH/BK) for a short to circuit 351 (BN/WH) or 359 (GY/RD). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A9 CHECK THE PCM CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Clear the DTCs.</li> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion.</li> <li>♦ pushed-out pins.</li> <li>♦ incorrectly seated connector.</li> </ul> </li> <li>• Connect and correctly seat all the PCM connectors.</li> <li>• Operate the system.</li> <li>• <b>Does the concern return?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test B: DTC P0645**

Refer to Wiring Diagrams Cell 54, Manual Climate Control System for schematic and connector information.

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

### Normal Operation

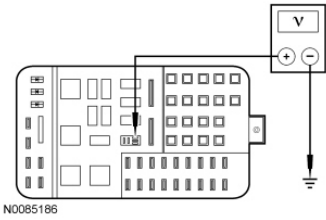
Under normal operation, voltage is provided to the A/C clutch relay coil. When A/C is requested and A/C line pressures allow, a ground is provided to the A/C clutch relay coil from the PCM, energizing the A/C clutch relay.

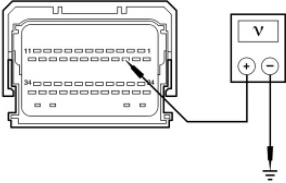
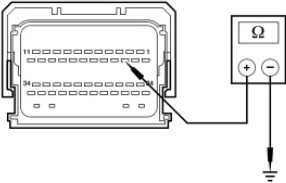
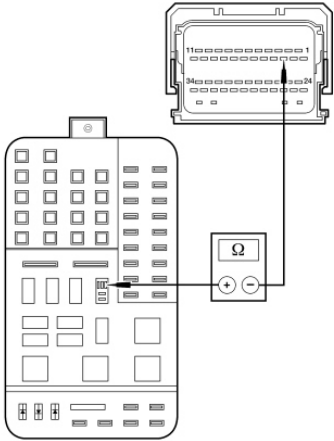
- DTC P0645 (A/C Clutch Relay Control Circuit) - The DTC sets when the PCM grounds the relay circuit and excessive current draw is detected on the relay circuit. The DTC also sets when the relay circuit is OFF and no voltage is detected on the relay circuit. The PCM expects to detect voltage coming through the relay coil to the relay circuit when it is not grounding it.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- A/C clutch relay
- PCM

### PINPOINT TEST B: DTC P0645

Test Step	Result / Action to Take
<b>B1 CHECK THE VOLTAGE TO THE A/C CLUTCH RELAY</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Clutch Relay.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and the A/C clutch relay socket pin 2, circuit 391 (RD/YE).</li> </ul>  <p>N0085186</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> CARRY OUT the A/C clutch relay component test.</p> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <p>If the relay tests OK, GO to <u>B2</u> .</p> <p><b>No</b> VERIFY Battery Junction Box (BJB) fuse 21 (15A) is OK. If OK, REPAIR circuit 391 (RD/YE) for an open. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>B2 CHECK CIRCUIT 73 (OG/LB) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and PCM C175B-14, circuit 73 (OG/LB), harness side.</li> </ul>	<p><b>Yes</b> REPAIR circuit 73 (OG/LB) for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>B3</u> .</p>

 <p>N0085103</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<p><b>B3 CHECK CIRCUIT 73 (OG/LB) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between ground and PCM C175B-14, circuit 73 (OG/LB), harness side.</li> </ul>  <p>N0085104</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B4</b> .</p> <p><b>No</b> REPAIR circuit 73 (OG/LB) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>B4 CHECK CIRCUIT 73 (OG/LB) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between A/C clutch relay socket pin 1, circuit 73 (OG/LB) and PCM C175B-14, circuit 73 (OG/LB), harness side.</li> </ul>  <p>N0085105</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B5</b> .</p> <p><b>No</b> REPAIR circuit 321 (GY/WH) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>



<b>B5 CHECK THE PCM CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Clear the DTCs.</li> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out pins.</li> <li>◆ incorrectly seated connector.</li> </ul> </li> <li>• Connect and correctly seat all the PCM connectors.</li> <li>• Operate the system.</li> <li>• <b>Does the concern return?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test C: DTC B1249**

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

**Normal Operation**

Under normal operation, to rotate the temperature blend door actuator, the HVAC module supplies voltage and ground to the temperature blend door actuators through the door actuator motor circuits. To reverse the temperature blend door actuator rotation, the HVAC module reverses the voltage and ground circuits.

The temperature blend door actuator feedback resistors are supplied a ground from the HVAC module by the temperature blend door actuator return circuits and a 5-volt reference voltage on the temperature blend door actuator reference circuits. The HVAC module reads the voltage on the temperature blend door actuator feedback circuits to determine the temperature blend door actuator position by the position of the actuator feedback resistor wiper arm.

During an actuator calibration cycle, the HVAC module drives the temperature blend door until the door reaches both internal stops in the HVAC case. If the temperature blend door is temporarily obstructed or binding during a calibration cycle, the HVAC module may interpret this as the actual end of travel for the door. When this condition occurs and the HVAC module commands the actuator to its end of travel, the airflow may not be the expected temperature.

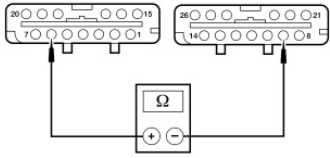
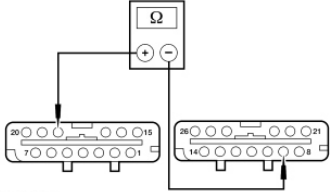
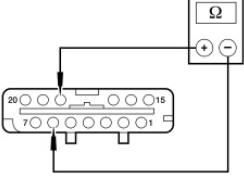
- DTC B1249 (Blend Door Failure) - The module senses no change in actuator feedback voltage when the actuator motor has been energized.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Temperature blend door actuator
- HVAC module
- Stuck or bound linkage or door

**PINPOINT TEST C: DTC B1249**

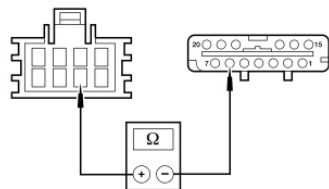
<b>Test Step</b>	<b>Result / Action to Take</b>
<b>C1 CHECK THE FEEDBACK POTENTIOMETER TOTAL RESISTANCE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228A.</li> <li>• Disconnect: HVAC Module C228B.</li> <li>• Measure the resistance between HVAC module C228A-6, circuit 600 (DB), harness side and HVAC module C228B-9, circuit 438 (RD/WH), harness side.</li> </ul>  <p>N0085372</p> <ul style="list-style-type: none"> <li>• Is the resistance between 5,000 and 6,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> If the resistance is greater than 6,000 ohms, GO to <u>C4</u> .</p> <p>If the resistance is less than 5,000 ohms, GO to <u>C5</u> .</p>
<p><b>C2 CHECK POTENTIOMETER LOW-SIDE RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between HVAC module C228A-18, circuit 437 (YE/LG), harness side and HVAC module C228B-9, circuit 438 (RD/WH), harness side.</li> </ul>  <p>N0085373</p> <ul style="list-style-type: none"> <li>• Is the resistance between 250 and 3,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> If the resistance is greater than 3,000 ohms, GO to <u>C6</u> .</p> <p>If the resistance is less than 250 ohms, GO to <u>C7</u> .</p>
<p><b>C3 CHECK POTENTIOMETER HIGH-SIDE RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between HVAC module C228A-6, circuit 600 (DB), harness side and HVAC module C228A-18, circuit 437 (YE/LG), harness side.</li> </ul>  <p>N0085374</p> <ul style="list-style-type: none"> <li>• Is the resistance between 3,000 and 6,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C9</u> .</p> <p><b>No</b> If the resistance is greater than 6,000 ohms, GO to <u>C14</u> . If the resistance is less than 3,000 ohms, GO to <u>C8</u> .</p>

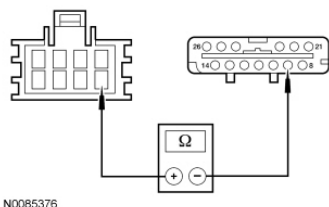
**C4 CHECK CIRCUITS 600 (DB) AND 438 (RD/WH)  
FOR AN OPEN**

**NOTE:** Access to the connector in the following step is difficult. Before performing this step, visually inspect the actuator and its harness for obvious damage. If no damage is evident, proceed with the test.

- Disconnect: Temperature Blend Door Actuator C289.
- Measure the resistance between HVAC module C228A-6, circuit 600 (DB), harness side and temperature blend door actuator C289-6, circuit 600 (DB), harness side.



- Measure the resistance between HVAC module C228B-9, circuit 438 (RD/WH), harness side and temperature blend door actuator C289-5, circuit 438 (RD/WH), harness side.



- **Are the resistances less than 5 ohms?**

**Yes**

GO to C14 .

**No**

REPAIR the affected circuit for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

**C5 CHECK CIRCUITS 438 (RD/WH) AND 600 (DB)  
FOR A SHORT TOGETHER**

**NOTE:** Access to the connector in the following step is difficult. Before performing this step, visually inspect the actuator and its harness for obvious damage. If no damage is evident, proceed with the test.

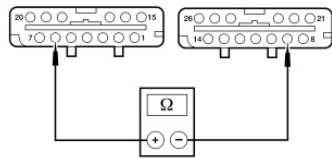
- Disconnect: Temperature Blend Door Actuator C289.
- Measure the resistance between HVAC module C228B-9, circuit 438 (RD/WH), harness side and HVAC module C228A-6, circuit 600 (DB), harness side.

**Yes**

GO to C14 .

**No**

REPAIR circuits 438 (RD/WH) for a short to circuit 600 (DB). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.



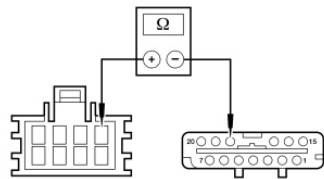
N0085372

- Is the resistance greater than 10,000 ohms?

#### C6 CHECK CIRCUIT 437 (YE/LG) FOR AN OPEN

**NOTE:** Access to the connector in the following step is difficult. Before performing this step, visually inspect the actuator and its harness for obvious damage. If no damage is evident, proceed with the test.

- Disconnect: Temperature Blend Door Actuator C289.
- Measure the resistance between HVAC module C228A-18, circuit 437 (YE/LG), harness side and temperature blend door actuator C289-1, circuit 437 (YE/LG), harness side.



N0085377

- Is the resistance less than 5 ohms?

#### C7 CHECK CIRCUITS 438 (RD/WH) AND 437 (YE/LG) FOR A SHORT TOGETHER

**NOTE:** Access to the connector in the following step is difficult. Before performing this step, visually inspect the actuator and its harness for obvious damage. If no damage is evident, proceed with the test.

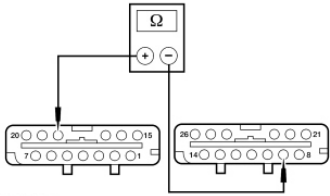
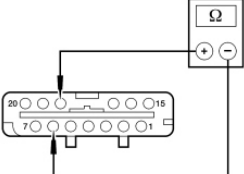
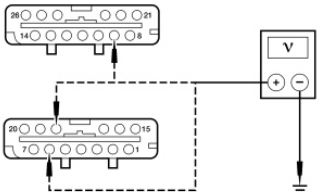
- Disconnect: Temperature Blend Door Actuator C289.
- Measure the resistance between HVAC module C228B-9, circuit 438 (RD/WH), harness side and HVAC module C228A-18, circuit 437 (YE/LG), harness side.

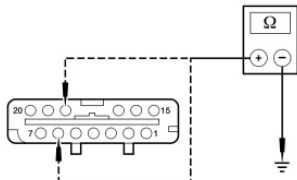
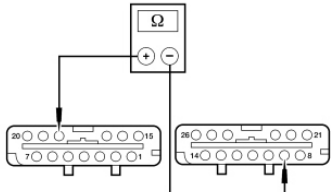
**Yes**  
GO to C14 .

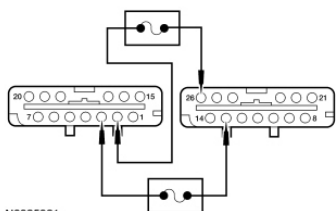
**No**  
REPAIR circuit 437 (YE/LG) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

**Yes**  
GO to C14 .

**No**  
REPAIR circuits 438 (RD/WH) and 437 (YE/LG) for a short together. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

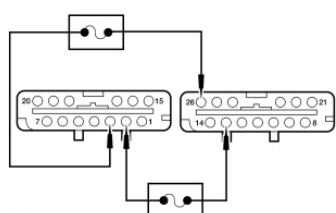
 <p>N0085373</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<p><b>C8 CHECK CIRCUIT 437 (YE/LG) FOR A SHORT TO CIRCUIT 436 (RD/LG) OR 600 (DB)</b></p>	
<p><b>NOTE:</b> Access to the connector in the following step is difficult. Before performing this step, visually inspect the actuator and its harness for obvious damage. If no damage is evident, proceed with the test.</p> <ul style="list-style-type: none"> <li>• Disconnect: Temperature Blend Door Actuator C289.</li> <li>• Measure the resistance between HVAC module C228A-6, circuit 600 (DB), harness side and HVAC module C228A-18, circuit 437 (YE/LG), harness side.</li> </ul>  <p>N0085374</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C14</u> .</p> <p><b>No</b> REPAIR circuits 437 (YE/LG) for a short to circuit 600 (DB). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>C9 CHECK CIRCUITS 600 (DB), 437 (YE/LG) AND 438 (RD/WH) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and: <ul style="list-style-type: none"> <li>◆ HVAC module C228A-6, circuit 600 (DB), harness side.</li> <li>◆ HVAC module C228A-18, circuit 437 (YE/LG), harness side.</li> <li>◆ HVAC module C228B-9, circuit 438 (RD/WH), harness side.</li> </ul> </li> </ul>  <p>N0085379</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the affected circuit for a short to voltage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C10</u> .</p>

<b>C10 CHECK CIRCUITS 600 (DB) AND 437 (YE/LG) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between ground and: <ul style="list-style-type: none"> <li>◆ HVAC module C228A-6, circuit 600 (DB), harness side.</li> <li>◆ HVAC module C228A-18, circuit 437 (YE/LG), harness side.</li> </ul> </li> </ul>  <p>N0085378</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSPECT for a broken door or linkage. If no condition is found, GO to <u>C11</u> .</p> <p><b>No</b> REPAIR circuit 600 (DB) or 437 (YE/LG) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>C11 CHECK THE BLEND DOOR ACTUATOR OPERATION</b>	
<p><b>NOTE:</b> If a jumper fuse opens while carrying out this test step, repair the circuit(s) for a short.</p> <ul style="list-style-type: none"> <li>• With the fused jumper connections made as directed below, measure the resistance between HVAC module C228A-18, circuit 437 (YE/LG), harness side and HVAC module C228B-9, circuit 438 (RD/WH), harness side.</li> </ul>  <p>N0085373</p> <ul style="list-style-type: none"> <li>• Connect a fused jumper wire between HVAC module C228B-26, circuit 246 (VT), harness side and HVAC module C228A-2, circuit 1566 (RD/YE), harness side. Connect a second fused jumper wire between HVAC module C228B-13, circuit 245 (BN/LG), harness side and HVAC module C228A-3, circuit 57 (BK), harness side.</li> </ul>	<p><b>Yes</b> INSPECT for binding or broken door and linkage. If no condition is found, GO to <u>C15</u> .</p> <p><b>No</b> GO to <u>C12</u> .</p>



N0085381

- Connect a fused jumper wire between HVAC module C228B-13, circuit 245 (BN/LG), harness side and HVAC module C228A-2, circuit 1566 (RD/YE), harness side. Connect a second fused jumper wire between HVAC module C228B-26, circuit 246 (VT), harness side and HVAC module C228A-3, circuit 57 (BK), harness side.

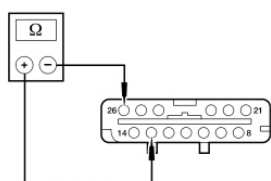


N0085380

- **Does the resistance smoothly increase and/or decrease when the jumpers are connected?**

### C12 CHECK THE ACTUATOR MOTOR DRIVE CIRCUITS

- Ignition OFF.
- Measure the resistance between HVAC module C228B-13, circuit 245 (BN/LG), harness side and HVAC module C228B-26, circuit 246 (VT), harness side.



N0085382

- **Is the resistance approximately 20-80 ohms?**

#### Yes

INSPECT for binding or broken door and linkage. If no condition is found, INSTALL a new door actuator. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

#### No

GO to C13 .

### C13 CHECK CIRCUITS 246 (VT) AND 245 (BN/LG) FOR AN OPEN

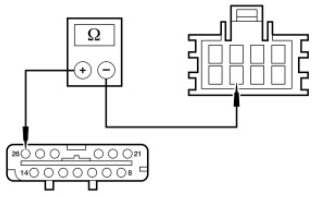
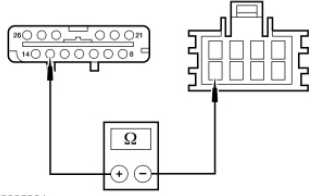
- Disconnect: Temperature Blend Door Actuator C289.
- Measure the resistance between HVAC module C228B-26, circuit 246 (VT), harness side and temperature blend door actuator C289-7, circuit 246 (VT), harness side.

#### Yes

GO to C14 .

#### No

REPAIR the affected circuit for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

 <p>N0085383</p> <ul style="list-style-type: none"> <li>• Measure the resistance between HVAC module C228B-13, circuit 245 (BN/LG), harness side and temperature blend door actuator C289-8, circuit 245 (BN/LG), harness side.</li> </ul>	
 <p>N0085384</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>C14 CHECK THE ACTUATOR CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the actuator connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> </ul> </li> <li>• Connect and correctly seat the actuator connector.</li> <li>• Clear the DTCs.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b>  <b>INSTALL</b> a new temperature blend door actuator. If a new actuator is installed, <b>CONNECT</b> the actuator electrical connectors before the HVAC module connectors. This will allow the new actuator to be calibrated when the HVAC module is reconnected. <b>CLEAR</b> the DTCs. <b>REPEAT</b> the self-test. <b>TEST</b> the system for normal operation.</p> <p><b>No</b>  The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. <b>CLEAR</b> the DTCs. <b>TEST</b> the system for normal operation.</p>
<b>C15 MODULE ACTUATOR POSITION CALIBRATION</b>	
<p><b>NOTE:</b> The purpose of the module actuator position calibration is to allow the HVAC module to reinitialize and calibrate the actuator stop points. To carry out the calibration, follow the steps below.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Inspect the module connectors for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> </ul> </li> </ul>	<p><b>Yes</b>  <b>INSTALL</b> a new HVAC module. <b>REFER</b> to <u>Section 412-01</u> . <b>TEST</b> the system for normal operation.</p> <p><b>No</b>  The system is now operating correctly at this time. The concern may have been caused by a foreign object in the HVAC case or temporary binding that restricted actuator</p>



<ul style="list-style-type: none"> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> <li>• Connect and correctly seat all the HVAC module connectors.</li> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Select any position except OFF.</li> <li>• <b>NOTE:</b> The HVAC module will now initialize and calibrate the actuators. Calibration of the actuators will take approximately 30 seconds.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p>door travel. CHECK any actuator external linkage. If condition recurs, INSPECT actuator linkage and door for binding and CHECK HVAC case for foreign objects.</p>
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### Pinpoint Test D: DTC B1251 or B1253

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

#### Normal Operation

Under normal operation, the in-vehicle air temperature sensor receives a ground from the HVAC module. The sensor varies its resistance with the temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The HVAC module measures this resistance to determine the temperature at the sensor.

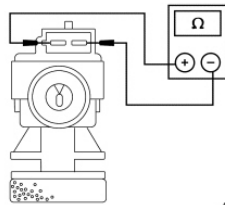
- DTC B1251 (Air Temperature Internal Sensor Circuit Open) - The module senses no voltage drop on the sensor reference voltage circuit, indicating an open circuit.
- DTC B1253 (Air Temperature Internal Sensor Circuit Short to Ground) - The module senses excessive voltage drop on the sensor reference voltage circuit, indicating a short directly to ground.

#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- In-vehicle air temperature sensor
- HVAC module

### PINPOINT TEST D: DTC B1251 OR B1253

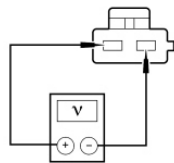
Test Step	Result / Action to Take
<b>D1 CHECK THE SENSOR RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: In-Vehicle Temperature Sensor C233.</li> <li>• Measure the resistance between the in-vehicle temperature sensor terminals.</li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> INSTALL a new in-vehicle temperature sensor. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>



- Is the resistance within the specified values for these temperature ranges: 10-20°C (50-68°F), 37,000-58,000 ohms; 20-30°C (68-86°F), 24,000-37,000 ohms; 30-40°C (86-104°F), 16,000-24,000 ohms?

**D2 CHECK THE HVAC SENSOR OUTPUT VOLTAGE**

- Ignition ON.
- Press the AUTOMATIC button.
- Measure the voltage between the in-vehicle temperature sensor C233-1, circuit 3060 (GY/RD), harness side and C233-2, circuit 3059 (YE/LG), harness side.



- Is the voltage between 4.7 and 5.1 volts?

**Yes**

INSTALL a new in-vehicle temperature sensor. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. If the code returns, GO to D7.

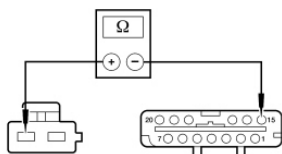
**No**

If diagnosing **DTC B1251**, GO to D3.

If diagnosing **DTC B1253**, GO to D5.

**D3 CHECK CIRCUIT 3060 (GY/RD) FOR AN OPEN**

- Ignition OFF.
- Disconnect: HVAC Module C228B.
- Measure the resistance between HVAC module C228B-21, circuit 3060 (GY/RD), harness side and in-vehicle temperature sensor C233-1, circuit 3060 (GY/RD), harness side.



- Is the resistance less than 5 ohms?

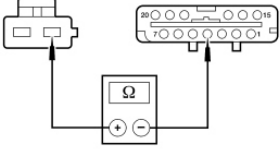
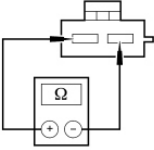
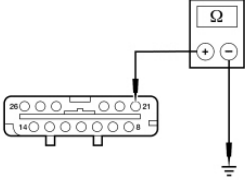
**Yes**

GO to D4.

**No**

REPAIR circuit 3060 (GY/RD) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

**D4 CHECK CIRCUIT 3059 (YE/LG) FOR AN OPEN**

<ul style="list-style-type: none"> <li>• Disconnect: HVAC Module C228A.</li> <li>• Measure the resistance between HVAC module C228A-4, circuit 3059 (YE/LG), harness side and in-vehicle temperature sensor C233-2, circuit 3059 (YE/LG), harness side.</li> </ul>  <p>N0085386</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> REPAIR circuit 3059 (YE/LG) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>D5 CHECK CIRCUITS 3060 (GY/RD) AND 3059 (YE/LG) FOR A SHORT TOGETHER</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228B.</li> <li>• Measure the resistance between in-vehicle temperature sensor C233-1, circuit 3060 (GY/RD), harness side and C233-2, circuit 3059 (YE/LG), harness side.</li> </ul>  <p>N0028516</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>D6</u> .</p> <p><b>No</b> REPAIR circuit 3059 (YE/LG) for a short to circuit 3060 (GY/RD). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>D6 CHECK CIRCUIT 3060 (GY/RD) FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between HVAC module C228B-21, circuit 3060 (GY/RD), harness side and ground.</li> </ul>  <p>N0085387</p> <p>• Is the resistance greater than 10,000 ohms?</p>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> REPAIR circuit 3060 (GY/RD) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>D7 CHECK THE HVAC MODULE CONNECTION</b></p>	

<ul style="list-style-type: none"> <li>• Inspect the module connectors for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> </ul> </li> <li>• Connect and correctly seat all the HVAC module connectors.</li> <li>• Clear the DTCs.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new HVAC module. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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**Pinpoint Test E: DTC B1255 or B1257**

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

**Normal Operation**

Under normal operation, the ambient air temperature sensor receives a ground from the HVAC module. The sensor varies its resistance with the temperature. As the temperature rises, the resistance falls. As the temperature falls, the resistance rises. The HVAC module measures this resistance to determine the temperature at the sensor.

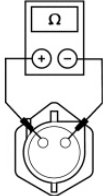
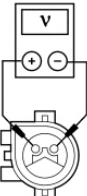
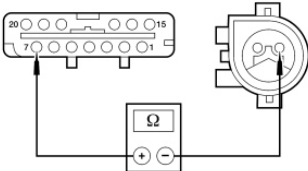
- DTC B1255 (Air Temperature External Sensor Circuit Open) - The module senses no voltage drop on the sensor reference voltage circuit, indicating an open circuit.
- DTC B1257 (Air Temperature External Sensor Circuit Short To Ground) - The module senses excessive voltage drop on the sensor reference voltage circuit, indicating a short directly to ground.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- A/C ambient temperature sensor
- HVAC module

**PINPOINT TEST E: DTC B1255 OR B1257**

Test Step	Result / Action to Take
<b>E1 CHECK THE AMBIENT TEMPERATURE SENSOR RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Ambient Temperature Sensor C132.</li> <li>• Measure the resistance between the ambient temperature sensor terminals.</li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> INSTALL a new ambient air temperature sensor. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>

 <p>A0002817</p> <ul style="list-style-type: none"> <li>• Is the resistance within the specified values for these temperature ranges: 10-20°C (50-68°F), 37,000-58,000 ohms; 20-30°C (68-86°F), 24,000-37,000 ohms; 30-40°C (86-104°F), 16,000-24,000 ohms?</li> </ul>	
<b>E2 CHECK THE HVAC MODULE OUTPUT VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Press the AUTOMATIC button.</li> <li>• Measure the voltage between ambient temperature sensor C132-1, circuit 3061 (LB/OG), harness side and C132-2, circuit 3059 (YE/LG), harness side.</li> </ul>  <p>A0002818</p> <ul style="list-style-type: none"> <li>• Is the voltage between 4.7 and 5.1 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new ambient air temperature sensor. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. If the code returns, GO to <u>E7</u> .</p> <p><b>No</b> If diagnosing <b>DTC B1255</b> , GO to <u>E3</u> .</p> <p>If diagnosing <b>DTC B1257</b> , GO to <u>E5</u> .</p>
<b>E3 CHECK CIRCUIT 3061 (LB/OG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228A.</li> <li>• Measure the resistance between HVAC module C228A-7, circuit 3061 (LB/OG), harness side and ambient temperature sensor C132-1, circuit 3061 (LB/OG), harness side.</li> </ul>  <p>N0085388</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> REPAIR circuit 3061 (LB/OG) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>E4 CHECK CIRCUIT 3059 (YE/LG) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between HVAC module C228A-4, circuit 3059 (YE/LG), harness side and ambient temperature sensor C132-2, circuit 3059 (YE/LG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>E7</u> .</p> <p><b>No</b> REPAIR circuit 3059 (YE/LG) for an open. CLEAR the DTCs.</p>

<p>N0085389</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p>REPEAT the self-test. TEST the system for normal operation.</p>
<b>E5 CHECK CIRCUITS 3061 (LG/OG) AND 3059 (YE/LG) FOR A SHORT TOGETHER</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228A.</li> <li>• Measure the resistance between ambient temperature sensor C132-1, circuit 3061 (LB/OG), harness side and C132-2, circuit 3059 (YE/LG), harness side.</li> </ul> <p>A0038068</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E6</u> .</p> <p><b>No</b> REPAIR circuit 3061 (LG/OG) for a short to circuit 3059 (YE/LG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>E6 CHECK CIRCUIT 3061 (LG/OG) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between HVAC module C228A-7, circuit 3061 (LG/OG), harness side and ground.</li> </ul> <p>N0085390</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E7</u> .</p> <p><b>No</b> REPAIR circuit 3061 (LG/OG) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>E7 CHECK THE HVAC MODULE CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Inspect the module connectors for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> </ul> </li> <li>• Connect and correctly seat all the HVAC module connectors.</li> <li>• Clear the DTCs.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new HVAC module. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or</p>

corroded connector.

**Pinpoint Test F: DTC B1259 or B1261**

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

**Normal Operation**

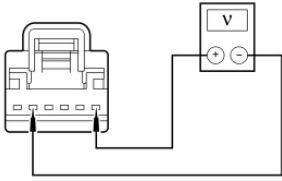
Under normal operation, the sunload sensor receives a ground. As the light applied to the sensor changes, the HVAC module detects the change through the feedback circuit.

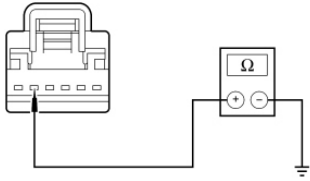
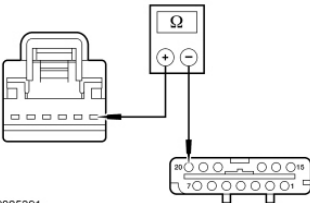
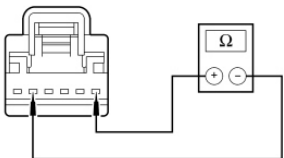
- DTC B1259 (Solar Radiation Sensor Circuit Open) - The module senses no voltage drop on the sensor reference voltage circuit, indicating an open circuit.
- DTC B1261 (Solar Radiation Sensor Circuit Short To Ground) - The module senses excessive voltage drop on the sensor reference voltage circuit, indicating a short directly to ground.

**This pinpoint test is intended to diagnose the following:**

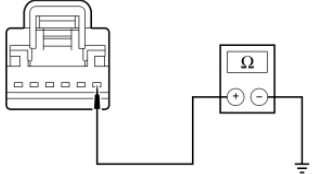
- Wiring, terminals or connectors
- Solar radiation sensor
- HVAC module

**PINPOINT TEST F: DTC B1259 OR B1261**

Test Step	Result / Action to Take
<b>F1 CHECK THE SOLAR RADIATION SENSOR REFERENCE VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Solar Radiation Sensor C287.</li> <li>• Ignition ON.</li> <li>• Press the AUTOMATIC button.</li> <li>• Measure the voltage between solar radiation sensor C287-1, circuit 476 (BN/YE), harness side and C287-5, circuit 676 (PK/OG), harness side.</li> </ul>  <p>A0015935</p> <ul style="list-style-type: none"> <li>• Is the voltage between 4.7 and 5.1 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new solar radiation sensor. CLEAR the DTCs. REPEAT the self-test. If the DTC returns, GO to <u>F6</u> .</p> <p><b>No</b> If diagnosing <b>DTC B1259</b> , GO to <u>F2</u> . If diagnosing <b>DTC B1261</b> , GO to <u>F4</u> .</p>
<b>F2 CHECK CIRCUIT 676 (PK/OG) FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between solar radiation sensor C287-5, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>A0015937</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>F3</b> .</p> <p><b>No</b> REPAIR circuit 676 (PK/OG) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>F3 CHECK CIRCUIT 476 (BN/YE) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: HVAC Module C228A.</li> <li>• Measure the resistance between HVAC module C228A-20, circuit 476 (BN/YE), harness side and solar radiation sensor C287-1, circuit 476 (BN/YE), harness side.</li> </ul>  <p>N0085391</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>F6</b> .</p> <p><b>No</b> REPAIR circuit 476 (BN/YE) for an open. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>F4 CHECK CIRCUITS 476 (BN/YE) AND 676 (PK/OG) FOR A SHORT TOGETHER</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228A.</li> <li>• Measure the resistance between solar radiation sensor C287-1, circuit 476 (BN/YE), harness side and C287-5, circuit 676 (PK/OG), harness side.</li> </ul>  <p>A0042617</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>F5</b> .</p> <p><b>No</b> REPAIR circuit 476 (BN/YE) for a short to circuit 676 (PK/OG). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>F5 CHECK CIRCUIT 476 (BN/YE) FOR A SHORT TO GROUND</b>	



<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228A.</li> <li>• Measure the resistance between solar radiation sensor C287-1, circuit 476 (BN/YE), harness side and ground.</li> </ul>  <p>A0015938</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>F6</b> .</p> <p><b>No</b> REPAIR circuit 476 (BN/YE) for a short to ground. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>F6 CHECK THE HVAC MODULE CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Inspect the module connectors for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> </ul> </li> <li>• Connect and correctly seat all the HVAC module connectors.</li> <li>• Clear the DTCs.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new HVAC module. REFER to <b>Section 412-01</b> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test G: Unable to Duplicate the Customer Concern and No DTCs Present****Normal Operation**

The purpose of this pinpoint test is to test the functions of the HVAC system and to identify the correct pinpoint test HVAC symptom.

**This pinpoint test is intended to diagnose the following:**

- Incorrect functioning of the HVAC system

**PINPOINT TEST G: UNABLE TO DUPLICATE THE CUSTOMER CONCERN AND NO DTCs PRESENT**

**NOTE:** Diagnose any HVAC module DTCs before carrying out the following pinpoint test.

**NOTE:** Some PCM DTCs may inhibit A/C operation. If any PCM DTCs are retrieved, diagnose those first. Refer to PCM DTC Chart.

Test Step	Result / Action to Take
<b>G1 CHECK THE BLOWER MOTOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Select PANEL mode.</li> </ul>	<p><b>Yes</b> GO to <b>G2</b> .</p>

<ul style="list-style-type: none"> <li>• Observe blower motor operation and select each blower motor speed.</li> <li>• <b>Does the blower motor operate in all selections and change speed in each?</b></li> </ul>	<p><b>No</b> Manual climate control systems, if the blower motor does not operate in any setting, <u>GO to Pinpoint Test O</u> .</p> <p>Electronic Automatic Temperature Control (EATC) systems, if the blower motor does not operate in any setting, <u>GO to Pinpoint Test Q</u> .</p> <p>Manual climate control systems, if the blower motor does not properly change speeds or shut OFF, <u>GO to Pinpoint Test P</u> .</p> <p>EATC systems, if the blower motor does not properly change speeds or shut OFF, <u>GO to Pinpoint Test R</u> .</p>
<b>G2 CHECK AIRFLOW OPERATION</b>	
<ul style="list-style-type: none"> <li>• Select the highest blower motor setting.</li> <li>• <b>NOTE:</b> Refer to Description and Operation in this section for proper airflow descriptions.</li> <li>• While observing the airflow, select each of the airflow positions (PANEL, PANEL/FLOOR, FLOOR, FLOOR/DEFROST, DEFROST).</li> <li>• <b>Is the airflow directed to the proper outlets?</b></li> </ul>	<p><b>Yes</b> GO to <u>G3</u> .</p> <p><b>No</b> Manual climate control systems, <u>GO to Pinpoint Test H</u> .</p> <p>EATC systems, <u>GO to Pinpoint Test I</u> .</p>
<b>G3 VERIFY TEMPERATURE CONTROL OPERATION</b>	
<ul style="list-style-type: none"> <li>• Start the vehicle and allow it to reach normal operating temperature.</li> <li>• With the A/C OFF, select PANEL mode.</li> <li>• Change the temperature setting from the coldest to the warmest and back to the coldest.</li> <li>• <b>Does the temperature change between very warm to cool?</b></li> </ul>	<p><b>Yes</b> GO to <u>G4</u> .</p> <p><b>No</b> If the temperature does not get very warm, <u>GO to Pinpoint Test J</u> .</p> <p>Manual climate control systems, if the temperature does not change at all, <u>GO to Pinpoint Test N</u> .</p> <p>EATC systems, if the temperature does not change at all, <u>GO to Pinpoint Test C</u> .</p>
<b>G4 VERIFY THE A/C CLUTCH DOES NOT ENGAGE WITH A/C OFF</b>	
<ul style="list-style-type: none"> <li>• With the A/C OFF, select PANEL mode.</li> <li>• Select the coldest temperature setting.</li> <li>• <b>Is the outlet temperature close to ambient temperature?</b></li> </ul>	<p><b>Yes</b> GO to <u>G5</u> .</p> <p><b>No</b> Manual climate control systems, if the temperature is warmer than ambient temperature, <u>GO to Pinpoint Test N</u> and diagnose for inoperative blend door.</p> <p>EATC systems, if the temperature is warmer</p>

	<p>than ambient temperature, <u>GO to Pinpoint Test C</u> and diagnose for inoperative blend door.</p> <p>If the outlet temperature is significantly colder than ambient temperature and the A/C compressor clutch cycles normally, <u>GO to Pinpoint Test M</u> .</p> <p>If the outlet temperature is significantly colder than ambient temperature and the A/C compressor clutch is engaged and does not cycle, <u>GO to Pinpoint Test L</u> .</p>
<b>G5 VERIFY A/C CLUTCH ENGAGEMENT IN THE A/C MODE</b>	
<ul style="list-style-type: none"> <li>• Make sure the ambient air temperature is above 2°C (35°F).</li> <li>• Select PANEL mode.</li> <li>• Press the A/C button (indicator ON).</li> <li>• <b>Does the A/C clutch engage when the PANEL and A/C button (indicator ON) is pressed?</b></li> </ul>	<p><b>Yes</b> GO to <u>G6</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test K</u> .</p>
<b>G6 CHECK THE RECIRC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Press the RECIRC button (indicator OFF).</li> <li>• Select PANEL mode.</li> <li>• Select the highest blower motor setting.</li> <li>• Observe airflow noise.</li> <li>• Press the RECIRC button (indicator ON).</li> <li>• <b>Does the airflow noise increase when the RECIRC mode is selected (indicator ON)?</b></li> </ul>	<p><b>Yes</b> The system is operating normally.</p> <p><b>No</b> Manual climate control systems, <u>GO to Pinpoint Test H</u> .</p> <p>EATC systems, <u>GO to Pinpoint Test I</u> .</p>

### Pinpoint Test H: Incorrect/Erratic Direction of Airflow from Outlets - Manual Climate Control

#### Normal Operation

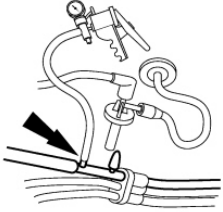
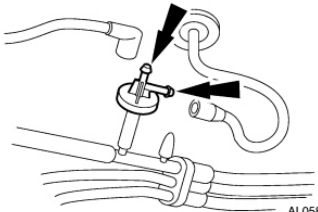
Under normal operation, the function selector switch is provided vacuum from the engine. When a position is selected, vacuum is applied to the desired vacuum control motor that is connected to the mode door it controls.

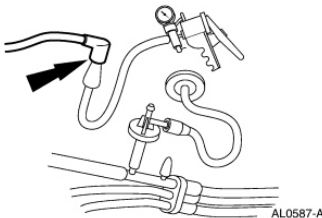
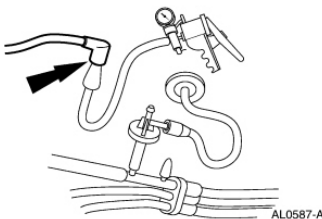
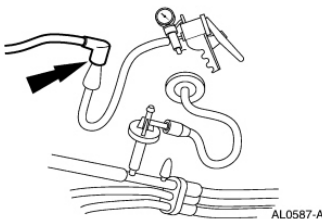
#### This pinpoint test is intended to diagnose the following:

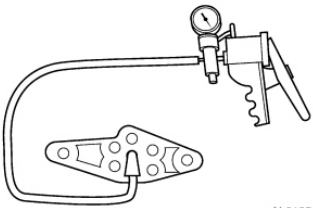
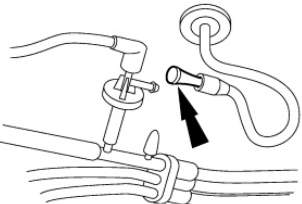
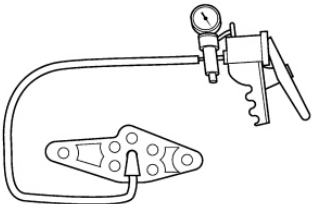
- Function selector switch
- Vacuum control motor
- Stuck or bound linkage or door
- Leaking or plugged vacuum hose

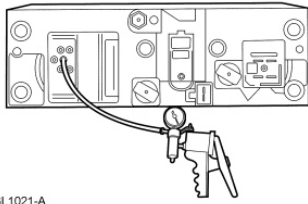
#### PINPOINT TEST H: INCORRECT/ERRATIC DIRECTION OF AIRFLOW FROM OUTLETS - MANUAL CLIMATE CONTROL

Test Step	Result / Action to Take
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H1 CHECK THE AIR FLOW IN EACH SETTING	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• With the engine running, set the blower motor speed to maximum.</li> <li>• Check the airflow in each function selector switch setting at engine idle and under acceleration.</li> <li>• <b>Is the airflow from only the defroster outlets in each function selector switch setting?</b></li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> NOTE the non-functional setting. GO to <u>H10</u> .</p>
H2 CHECK FOR VACUUM AT THE CHECK VALVE	
<ul style="list-style-type: none"> <li>• Disconnect the vacuum check valve vacuum source line and check for manifold vacuum and connect the vacuum pump.</li> </ul>  <p><b>Is manifold vacuum present at the check valve vacuum source line?</b></p>	<p><b>Yes</b> GO to <u>H3</u> .</p> <p><b>No</b> REPAIR or INSTALL a new check valve vacuum source line. TEST the system for normal operation.</p>
H3 CHECK THE VACUUM CHECK VALVE FOR BLOCKAGE	
<ul style="list-style-type: none"> <li>• Reconnect the vacuum source line to the vacuum check valve.</li> <li>• Disconnect the vacuum reservoir line and the manual climate control assembly vacuum line from the vacuum check valve and plug one port.</li> </ul>  <ul style="list-style-type: none"> <li>• Check for manifold vacuum at the open port on the vacuum check valve.</li> <li>• <b>Is manifold vacuum present at the open port on the vacuum check valve?</b></li> </ul>	<p><b>Yes</b> GO to <u>H4</u> .</p> <p><b>No</b> INSTALL a new vacuum check valve. TEST the system for normal operation.</p>
H4 CHECK THE VACUUM CHECK VALVE	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect the vacuum pump to the open port on the vacuum check valve and attempt to pull a vacuum.</li> <li>• <b>Can a vacuum be pulled on the vacuum check valve?</b></li> </ul>	<p><b>Yes</b> GO to <u>H5</u> .</p> <p><b>No</b> INSTALL a new vacuum check valve. TEST the system for normal operation.</p>

<b>H5 CHECK THE VACUUM RESERVOIR LINE FOR BLOCKAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect the vacuum reservoir line at the vacuum reservoir.</li> <li>• Connect the vacuum pump to the vacuum reservoir line at the vacuum check valve connection and attempt to pull a vacuum.</li> </ul>  <ul style="list-style-type: none"> <li>• Can a vacuum be pulled on the vacuum reservoir line?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum reservoir line. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H6</u> .</p>
<b>H6 CHECK THE VACUUM RESERVOIR LINE FOR LEAKS</b>	
<ul style="list-style-type: none"> <li>• Plug the vacuum reservoir line at the vacuum reservoir connection.</li> <li>• Leak test the vacuum reservoir line using the vacuum pump.</li> </ul>  <ul style="list-style-type: none"> <li>• Does the vacuum reservoir line leak?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum reservoir line. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H7</u> .</p>
<b>H7 CHECK THE VACUUM RESERVOIR FOR A LEAK</b>	
<ul style="list-style-type: none"> <li>• Connect the vacuum pump reservoir line to the vacuum reservoir.</li> <li>• With the vacuum pump connected to the vacuum reservoir line, leak test the vacuum reservoir.</li> </ul>  <ul style="list-style-type: none"> <li>• Does the vacuum reservoir leak?</li> </ul>	<p><b>Yes</b> INSTALL a new vacuum reservoir. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H8</u> .</p>
<b>H8 CHECK THE FUNCTION SELECTOR SWITCH VACUUM SOURCE LINE FOR BLOCKAGE</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Function Selector Switch Vacuum Connector.</li> <li>• Connect the vacuum pump to the function selector switch vacuum source line and attempt to pull a vacuum.</li> </ul>  <p>AL0135-A</p> <ul style="list-style-type: none"> <li>• Can a vacuum be pulled on the function selector switch vacuum source line?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new function selector switch vacuum source line. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H9</u> .</p>
<p><b>H9 CHECK THE FUNCTION SELECTOR SWITCH VACUUM SOURCE LINE FOR LEAKS</b></p>	
<ul style="list-style-type: none"> <li>• Plug the function selector switch vacuum source line at the vacuum check valve connection.</li> </ul>  <p>AL0588-A</p> <ul style="list-style-type: none"> <li>• Leak test the function selector switch vacuum source line using the vacuum pump.</li> </ul>  <p>AL0135-A</p> <ul style="list-style-type: none"> <li>• Does the function selector switch vacuum source line leak?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new function selector switch vacuum source line. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new function selector switch. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p>
<p><b>H10 CHECK THE FUNCTION SELECTOR SWITCH FOR BLOCKAGE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Function Selector Switch Vacuum Harness.</li> <li>• Connect a vacuum pump to the function selector switch vacuum supply port and try to pull a vacuum in each function selector switch position. If the vacuum pump can pull and hold a vacuum, the switch is plugged. If the vacuum pump pulls a vacuum that slowly decays, the hose is restricted.</li> </ul>	<p><b>Yes</b> INSTALL a new function selector switch. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H11</u> .</p>

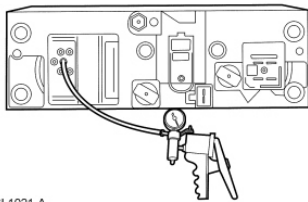


GL1021-A

- Is the switch plugged or restricted?

### H11 LEAK TEST THE FUNCTION SELECTOR SWITCH

- Connect a vacuum pump to the function selector switch vacuum supply port and plug each control port.



GL1021-A

- At each function selector switch position apply 51 kPa (15 in-Hg) of vacuum.
- Does the vacuum drop exceed 3.37 kPa (1 in-Hg) per minute?

**Yes**

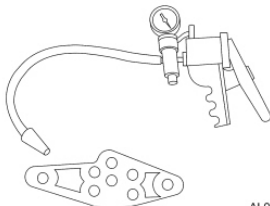
INSTALL a new function selector switch. REFER to Section 412-01 . TEST the system for normal operation.

**No**

GO to H12 .

### H12 CHECK THE VACUUM HOSE

- Disconnect the vacuum line from the appropriate vacuum control motor noted in Step H1.
- Connect the vacuum pump to the appropriate vacuum control motor line noted in Step H1 and attempt to pull and hold a vacuum.



AL0157-A

- Does the vacuum in the line drop exceed 3.37 kPa (1 in-Hg) per minute?

**Yes**

GO to H13 .

**No**

GO to H14 .

### H13 CHECK THE VACUUM CONTROL MOTOR

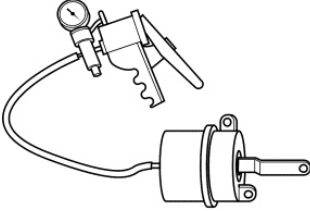
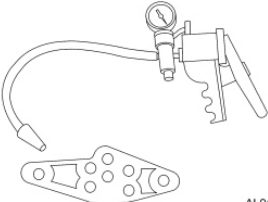
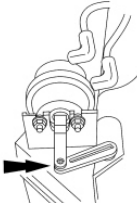
- Disconnect: Vacuum Control Motor.
- Connect a vacuum pump to the affected vacuum control motor. Apply 51 kPa (15 in-Hg) of vacuum.

**Yes**

INSTALL a new vacuum control motor. REFER to Section 412-01 . TEST the system for normal operation.

**No**

REPAIR or INSTALL a new

 <p>AL0136-A</p> <ul style="list-style-type: none"> <li>• Does the vacuum drop exceed 1.68 kPa (0.5 in-Hg) per minute?</li> </ul>	<p>vacuum harness. TEST the system for normal operation.</p>
<p><b>H14 CHECK THE VACUUM CONTROL MOTOR HOSES FOR BLOCKAGE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Vacuum Control Motors.</li> <li>• Connect a vacuum pump to each hose and try to pull a vacuum. If the vacuum pump can pull and hold a vacuum, the hose is plugged. If the vacuum pump pulls a vacuum that slowly decays, the hose is restricted.</li> </ul>  <p>AL0157-A</p> <ul style="list-style-type: none"> <li>• Is the hose plugged or restricted?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum harness. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>H15</u> .</p>
<p><b>H15 CHECK THE VACUUM CONTROL MOTOR INSTALLATION</b></p>	
<ul style="list-style-type: none"> <li>• Check the attachment of the vacuum control motor arm to the damper door.</li> </ul>  <p>AL0158-A</p> <ul style="list-style-type: none"> <li>• Is the vacuum control motor arm attached to the door or door crank arm?</li> </ul>	<p><b>Yes</b> REPAIR the damper door. TEST the system for normal operation.</p> <p><b>No</b> CONNECT the vacuum control motor arm to the door crank arm. TEST the system for normal operation.</p>

## Pinpoint Test I: Incorrect/Erratic Direction of Airflow from Outlets - EATC

### Normal Operation

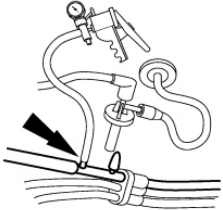
Under normal operation, the HVAC module is provided vacuum from the engine. When a mode is selected, vacuum is applied to the desired vacuum control motor that is connected to the mode door you want to control.

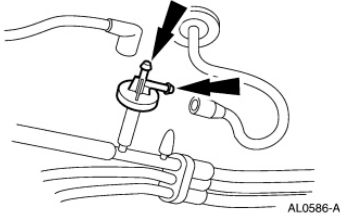
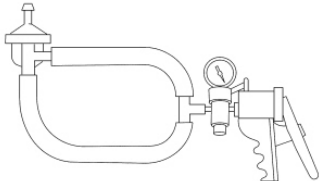
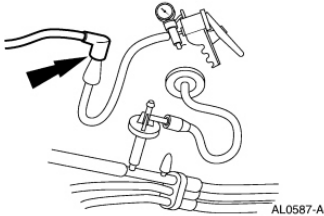


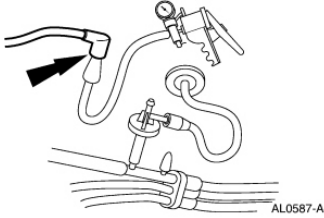
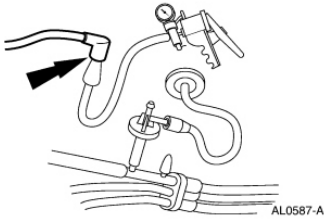
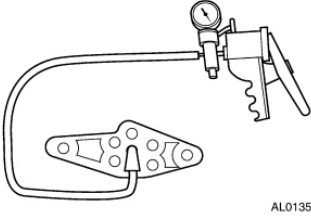
**This pinpoint test is intended to diagnose the following:**

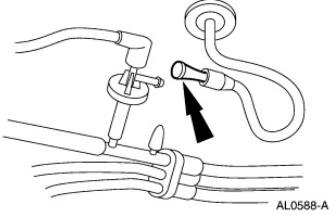
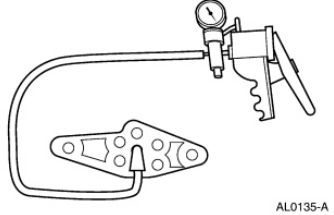
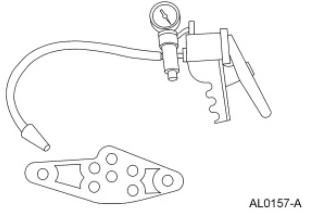
- HVAC module
- Heater control valve
- Vacuum control motor
- Stuck or bound linkage or door
- Leaking or plugged vacuum hose

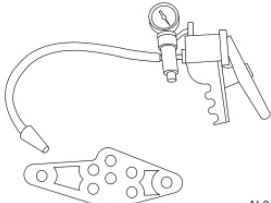
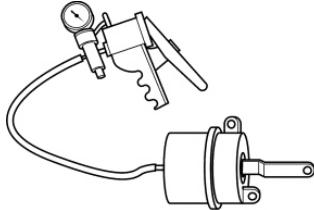
**PINPOINT TEST I: INCORRECT/ERRATIC DIRECTION OF AIRFLOW FROM OUTLETS - EATC**

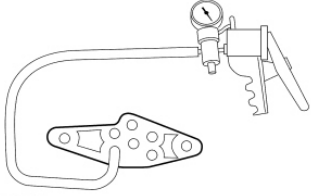
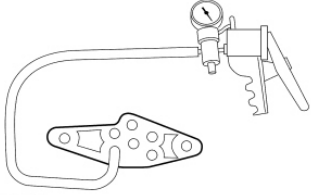
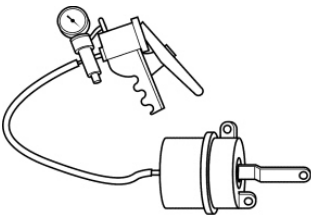
Test Step	Result / Action to Take
<b>I1 CHECK THE AIRFLOW IN EACH SETTING</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• With the engine running, check the airflow in each manual override setting on the HVAC module during engine idle and under acceleration.</li> <li>• <b>Is the airflow correct in each manual override setting?</b></li> </ul>	<p><b>Yes</b> The system is operating normally.</p> <p><b>No</b> If the airflow is from the defrost outlet only in all settings, GO to <u>I2</u> .</p> <p>If the airflow is incorrect in one setting only, NOTE the non-functional setting. GO to <u>I10</u> .</p> <p>If the airflow is incorrect in MAX only, GO to <u>I14</u> .</p>
<b>I2 CHECK FOR VACUUM AT THE CHECK VALVE</b>	
<ul style="list-style-type: none"> <li>• Disconnect the vacuum check valve vacuum source line and connect the vacuum pump.</li> </ul>  <p>AL0585-A</p> <ul style="list-style-type: none"> <li>• <b>Is manifold vacuum present at the check valve vacuum source line?</b></li> </ul>	<p><b>Yes</b> GO to <u>I3</u> .</p> <p><b>No</b> REPAIR or INSTALL a new check valve vacuum source line. TEST the system for normal operation.</p>
<b>I3 CHECK THE VACUUM CHECK VALVE FOR BLOCKAGE</b>	
<ul style="list-style-type: none"> <li>• Reconnect the vacuum source line to the vacuum check valve.</li> <li>• Disconnect the vacuum reservoir line and the HVAC module vacuum line from the vacuum check valve and plug one port.</li> </ul>	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> INSTALL a new vacuum check valve. TEST the system for normal operation.</p>

 <ul style="list-style-type: none"> <li>• Check for manifold vacuum at the open port on the vacuum check valve.</li> <li>• <b>Is manifold vacuum present at the open port on the vacuum check valve?</b></li> </ul>	
<b>I4 CHECK THE VACUUM CHECK VALVE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Vacuum Check Valve.</li> <li>• Connect the vacuum pump to the vacuum check valve and attempt to pull a vacuum.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Can a vacuum be pulled on the vacuum check valve?</b></li> </ul>	<p><b>Yes</b> GO to <u>I5</u> .</p> <p><b>No</b> INSTALL a new vacuum check valve. TEST the system for normal operation.</p>
<b>I5 CHECK THE VACUUM RESERVOIR LINE FOR BLOCKAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect the vacuum reservoir line at the vacuum reservoir.</li> <li>• Connect the vacuum pump to the vacuum reservoir line at the vacuum check valve connection and attempt to pull a vacuum.</li> </ul>  <ul style="list-style-type: none"> <li>• <b>Can a vacuum be pulled on the vacuum reservoir line?</b></li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum reservoir line. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>I6</u> .</p>
<b>I6 CHECK THE VACUUM RESERVOIR LINE FOR LEAKS</b>	

<ul style="list-style-type: none"> <li>• Plug the vacuum reservoir line at the vacuum reservoir connection.</li> <li>• Leak test the vacuum reservoir line using the vacuum pump.</li> </ul>  <p><b>• Does the vacuum reservoir line leak?</b></p>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum reservoir line. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>17</u> .</p>
<b>17 CHECK THE VACUUM RESERVOIR FOR A LEAK</b>	
<ul style="list-style-type: none"> <li>• Connect the vacuum pump reservoir line to the vacuum reservoir.</li> <li>• With the vacuum pump connected to the vacuum reservoir line, leak test the vacuum reservoir.</li> </ul>  <p><b>• Does the vacuum reservoir leak?</b></p>	<p><b>Yes</b> INSTALL a new vacuum reservoir. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>18</u> .</p>
<b>18 CHECK THE HVAC MODULE VACUUM SOURCE LINE FOR BLOCKAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: HVAC Module Vacuum Connector.</li> <li>• Connect the vacuum pump to the HVAC module vacuum source line and attempt to pull a vacuum.</li> </ul>  <p><b>• Can a vacuum be pulled on the HVAC module vacuum source line?</b></p>	<p><b>Yes</b> REPAIR or INSTALL a new HVAC module vacuum source line. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>19</u> .</p>
<b>19 CHECK THE HVAC MODULE VACUUM SOURCE LINE FOR LEAKS</b>	

<ul style="list-style-type: none"> <li>• Plug the HVAC module vacuum source line at the vacuum check valve connection.</li> </ul>  <ul style="list-style-type: none"> <li>• Leak test the HVAC module vacuum source line using the vacuum pump.</li> </ul>  <ul style="list-style-type: none"> <li>• Does the HVAC module vacuum source line leak?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new HVAC module vacuum source line. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new HVAC module. TEST the system for normal operation.</p>
<p><b>I10 CHECK THE VACUUM CONTROL MOTOR LINE FOR BLOCKAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module Vacuum Connector.</li> <li>• Disconnect the vacuum line from the appropriate vacuum control motor noted in Step I1.</li> <li>• Connect the vacuum pump to the appropriate vacuum control motor line noted in Step I1, and attempt to pull a vacuum.</li> </ul>  <ul style="list-style-type: none"> <li>• Can a vacuum be pulled on the vacuum control motor line?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum harness. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>I11</u> .</p>
<p><b>I11 CHECK THE VACUUM CONTROL MOTOR LINE FOR LEAKS</b></p>	

<ul style="list-style-type: none"> <li>• Plug the vacuum control motor line at the vacuum control motor connection.</li> <li>• Leak test the vacuum control motor line using the vacuum pump.</li> </ul>  <p style="text-align: center;">AL0157-A</p> <ul style="list-style-type: none"> <li>• <b>Does the vacuum control motor line leak?</b></li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum harness. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>I12</u> .</p>
<b>I12 CHECK THE VACUUM CONTROL MOTOR FOR LEAKS AND CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Connect the vacuum pump to the appropriate vacuum control motor and pull a vacuum.</li> </ul>  <p style="text-align: center;">AL0136-A</p> <ul style="list-style-type: none"> <li>• <b>Does the vacuum control motor operate and hold vacuum?</b></li> </ul>	<p><b>Yes</b> GO to <u>I13</u> .</p> <p><b>No</b> INSTALL a new vacuum control motor. TEST the system for normal operation.</p>
<b>I13 CHECK THE MODE DOOR LINKAGE AND MOVEMENT</b>	
<ul style="list-style-type: none"> <li>• Inspect the mode door linkage and verify correct movement of the mode door.</li> <li>• <b>Is the mode door or mode door linkage broken, binding or otherwise obstructed?</b></li> </ul>	<p><b>Yes</b> REPAIR the mode door or mode door linkage as necessary. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new HVAC module. TEST the system for normal operation.</p>
<b>I14 CHECK THE AIR INLET DOOR VACUUM CONTROL MOTOR LINE FOR BLOCKAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the air inlet door vacuum control motor vacuum connector.</li> <li>• Disconnect the HVAC module vacuum connector and attempt to pull a vacuum on the RECIRC vacuum control motor line using the vacuum pump.</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new plenum vacuum harness. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>I15</u> .</p>

 <p>A0036133</p> <ul style="list-style-type: none"> <li>• Can a vacuum be pulled on the air inlet door vacuum control motor line?</li> </ul>	
<p><b>I15 CHECK THE AIR INLET DOOR VACUUM CONTROL MOTOR LINE FOR LEAKS.</b></p>	
<ul style="list-style-type: none"> <li>• Plug the air inlet door vacuum control motor line at the RECIRC vacuum control motor connection.</li> <li>• Leak test the air inlet door vacuum control motor line using the vacuum pump.</li> </ul>  <p>A0036133</p> <ul style="list-style-type: none"> <li>• Does the air inlet door vacuum control motor line leak?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new vacuum harness. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>I16</u> .</p>
<p><b>I16 CHECK THE AIR INLET DOOR VACUUM CONTROL MOTOR FOR LEAKS AND CORRECT OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Connect the vacuum pump to the air inlet door vacuum control motor and pull a vacuum.</li> </ul>  <p>AL0136-A</p> <ul style="list-style-type: none"> <li>• Does the air inlet door vacuum control motor operate and hold a vacuum?</li> </ul>	<p><b>Yes</b> GO to <u>I17</u> .</p> <p><b>No</b> INSTALL a new air inlet door vacuum control motor. TEST the system for normal operation.</p>
<p><b>I17 INSPECT THE AIR INLET DOOR LINKAGE AND MOVEMENT</b></p>	
<ul style="list-style-type: none"> <li>• Inspect the air inlet door linkage and verify correct movement of the door.</li> <li>• Is the air inlet door or air inlet door linkage broken, binding or otherwise obstructed?</li> </ul>	<p><b>Yes</b> REPAIR the air inlet door or air inlet door linkage as needed. TEST the system for correct operation.</p> <p><b>No</b></p>

INSTALL a new HVAC module. TEST the system for normal operation.
--

**Pinpoint Test J: Insufficient, Erratic or No Heat****Normal Operation**

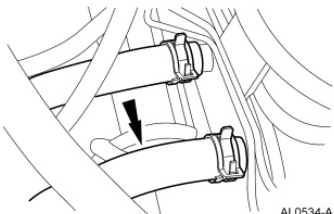
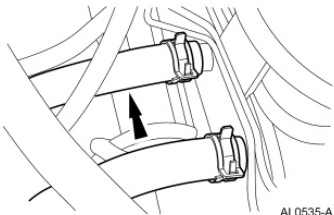
Under normal operation, warm coolant flows from the engine through the heater core and back to the engine.

**This pinpoint test is intended to diagnose the following:**

- Plugged heater core
- Coolant level
- Temperature blend door

**PINPOINT TEST J: INSUFFICIENT, ERRATIC OR NO HEAT**

Test Step	Result / Action to Take
<b>J1 CHECK FOR CORRECT ENGINE COOLANT LEVEL</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the engine coolant level when hot and when cold.</li> <li>• <b>Is the engine coolant at correct level (hot and cold) as indicated on the engine coolant recovery reservoir?</b></li> </ul>	<b>Yes</b> GO to <u>J3</u> .  <b>No</b> GO to <u>J2</u> .
<b>J2 CHECK THE COOLANT SYSTEM INCLUDING THE RADIATOR CAP FOR LEAKS</b>	
<ul style="list-style-type: none"> <li>• Pressure test the cooling system for leaks. Refer to <u>Section 303-03</u> .</li> <li>• <b>Does the engine cooling system leak?</b></li> </ul>	<b>Yes</b> REPAIR the engine coolant leak. TEST the system for normal operation.  <b>No</b> FILL and BLEED the cooling system. REFER to <u>Section 303-03</u> . After filling and bleeding the cooling system, GO to <u>J3</u> .
<b>J3 CHECK FOR COOLANT FLOW TO THE HEATER CORE</b>	
<ul style="list-style-type: none"> <li>• Run the engine until it reaches normal operation temperature. Select the FLOOR position on the control assembly. Set the temperature control to full warm and the blower to the lowest setting.</li> <li>• Using a suitable temperature measuring device, check the heater core inlet hose to see if it is hot.</li> </ul>	<b>Yes</b> GO to <u>J4</u> .  <b>No</b> REFER to <u>Section 303-03</u> to check cooling system function.

 <p>AL0534-A</p> <p>• Is the heater core inlet hose hot?</p>	
<p><b>J4 CHECK FOR A PLUGGED OR RESTRICTED HEATER CORE</b></p>	
<p>• Using a suitable temperature measuring device, measure the heater core outlet hose temperature.</p>  <p>AL0535-A</p> <p>• Is the heater core outlet hose temperature similar to the inlet hose temperature (6-17°C [10-30°F])?</p>	<p><b>Yes</b> Vehicles with manual climate control, <u>GO to Pinpoint Test N</u> . Vehicles with Electronic Automatic Temperature Control (EATC), <u>GO to Pinpoint Test C</u> .</p> <p><b>No</b> CARRY OUT the Heater Core Component Test. REFER to Heater Core under Component Tests in this section to determine whether a plugged or partial plugged condition exists.</p>

### Pinpoint Test K: The Air Conditioning (A/C) is Inoperative

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

#### Normal Operation

Under normal operation, when A/C is requested, the climate control assembly or HVAC module sends voltage to the A/C cycling switch. The PCM receives input from the A/C cycling switch, when closed (sufficient pressure). The A/C cycling switch is used for A/C compressor cycling. The switch is used by the PCM to turn off the A/C compressor before the line pressures are low enough to drop the evaporator temperature excessively low and freeze the condensation.

Voltage is provided to the A/C clutch relay switch. When the PCM energizes the relay, voltage is supplied to the A/C clutch from the relay. Ground is supplied for the A/C clutch.

When an A/C request is received by the PCM, the A/C compressor clutch will only be engaged through the A/C clutch relay if all of the following conditions are met:

- The PCM does not detect excessively high or low refrigerant pressure from the A/C pressure transducer.
- The PCM does not detect excessively low refrigerant pressure from the A/C cycling switch.
- The PCM does not detect excessively high engine coolant temperature.
- The PCM does not detect an ambient air temperature too low.
- The PCM has not detected a Wide Open Throttle (WOT) condition.



**This pinpoint test is intended to diagnose the following:**

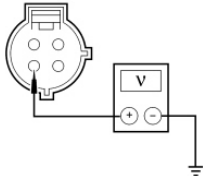
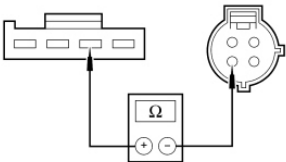
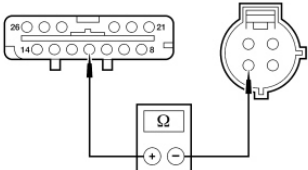
- Fuse(s)
- Wiring, terminals or connectors
- A/C pressure transducer
- PCM
- A/C clutch relay
- Function selector switch
- HVAC module
- A/C cycling switch
- A/C compressor clutch field coil
- A/C clutch air gap

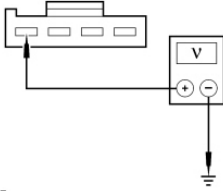
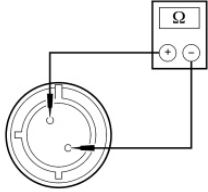
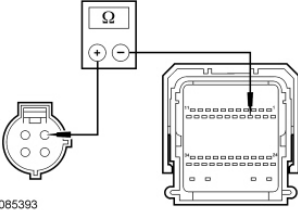
**PINPOINT TEST K: THE AIR CONDITIONING (A/C) IS INOPERATIVE**

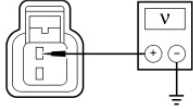
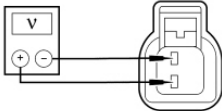
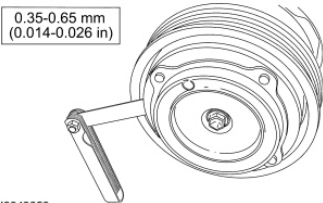
**NOTE:** Some PCM DTCs may inhibit A/C operation. If any PCM DTCs are retrieved, diagnose those first. Refer to the PCM DTC Chart in this section.

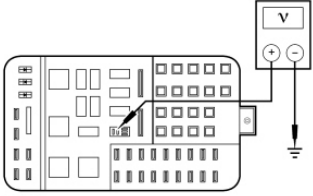
**NOTE:** Before carrying out the following test, check that the A/C system pressure is above 290 kPa (42 psi). If the pressure is below 290 kPa (42 psi), refer to Fluorescent Dye Leak Detection in this section.

Test Step	Result / Action to Take
<b>K1 CHECK THE A/C PRESSURE SENSOR (ACP_PRESS) PCM PID</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: ACP_PRESS PCM PID.</li> <li>• With the manifold gauge set connected, compare the pressure readings of the manifold gauge set and the ACP_PRESS PID.</li> <li>• <b>Are the pressure values of the manifold gauge set and the ACP_PRESS PID similar?</b></li> </ul>	<p><b>Yes</b> GO to <u>K2</u> .</p> <p><b>No</b> INSTALL a new A/C pressure transducer. TEST the system for normal operation.</p>
<b>K2 CHECK THE AIR CONDITIONING CYCLING SWITCH (ACCS) PCM PID WITH THE A/C ON</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: ACCS PCM PID.</li> <li>• Place the function selector switch in the MAX A/C position or press the PANEL and A/C manual override buttons on the HVAC module.</li> <li>• <b>Does the PCM PID ACCS read ON?</b></li> </ul>	<p><b>Yes</b> GO to <u>K3</u> .</p> <p><b>No</b> GO to <u>K4</u> .</p>
<b>K3 CHECK THE AIR CONDITIONING CLUTCH (WAC/ACCR) PCM PID WITH THE A/C ON</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: WAC/ACCR PCM PID.</li> <li>• <b>Does the WAC/ACCR PCM PID read ON?</b></li> </ul>	<p><b>Yes</b> GO to <u>K9</u> .</p> <p><b>No</b> GO to <u>K13</u> .</p>
<b>K4 CHECK A/C CYCLING SWITCH VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Cycling Switch C1081.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the A/C cycling switch C1081-4, circuit 348 (VT), harness side and ground.</li> </ul>  <p>A0040571</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> GO to <u>K7</u> .</p> <p><b>No</b> GO to <u>K5</u> .</p>
<b>K5 CHECK CIRCUIT 348 (VT) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Function Selector Switch C294A or HVAC Module C228B.</li> <li>• <b>NOTE:</b> Manual climate control systems only.</li> <li>• Measure the resistance between selector switch C294A-2, circuit 348 (VT), harness side and A/C cycling switch C1081-4, circuit 348 (VT), harness side.</li> </ul>  <p>A0051601</p> <ul style="list-style-type: none"> <li>• <b>NOTE:</b> EATC systems only.</li> <li>• Measure the resistance between A/C cycling switch C1081-4, circuit 348 (VT), harness side and HVAC module C228B-11, circuit 348 (VT), harness side.</li> </ul>  <p>N0085392</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> Manual climate control systems, GO to <u>K6</u> .</p> <p>Electronic Automatic Temperature Control (EATC) systems, GO to <u>K14</u> .</p> <p><b>No</b> REPAIR circuit 348 (VT) for an open. TEST the system for normal operation.</p>
<b>K6 CHECK CIRCUIT 1040 (RD/BK) FOR VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Function Selector Switch C294A.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between ground and function selector switch C294A-4, circuit 1040 (RD/BK), harness side.</li> </ul>  <p>N0078467</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> INSTALL a new function selector switch. TEST the system for normal operation.</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 17 (10A) is OK. If OK, REPAIR circuit 1040 (RD/BK) for an open. TEST the system for normal operation.</p>
<b>K7 CHECK A/C CYCLING SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the A/C cycling switch terminals.</li> </ul>  <p>N0029346</p> <p>• Is the resistance less than 21 ohms?</p>	<p><b>Yes</b> GO to <u>K8</u> .</p> <p><b>No</b> INSTALL a new A/C cycling switch. TEST the system for normal operation.</p>
<b>K8 CHECK CIRCUIT 883 (PK/LB) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: PCM C175B.</li> <li>• Measure the resistance between A/C cycling switch C1081-1, circuit 883 (PK/LB), harness side and PCM C175B-15, circuit 883 (PK/LB), harness side.</li> </ul>  <p>N0085393</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>K13</u> .</p> <p><b>No</b> REPAIR circuit 883 (PK/LB) for an open. TEST the system for normal operation.</p>
<b>K9 CHECK THE VOLTAGE AT THE A/C COMPRESSOR CLUTCH FIELD COIL</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Compressor Clutch Field Coil C100.</li> <li>• Ignition ON.</li> <li>• Start the engine.</li> <li>• With the engine running, measure the voltage between A/C compressor clutch field coil C100-1, circuit 321 (GY/WH), harness side and ground.</li> </ul>  <p>A0048576</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <b>K10</b> .</p> <p><b>No</b> INSTALL a known good A/C relay. TEST the system for normal operation. If the condition remains, GO to <b>K12</b> .</p>
<p><b>K10 CHECK THE GROUND AT THE A/C COMPRESSOR CLUTCH FIELD COIL</b></p>	
<ul style="list-style-type: none"> <li>• With the engine running, measure the voltage between A/C compressor clutch field coil C100-2, circuit 57 (BK), harness side and A/C compressor clutch field coil C100-1, circuit 321 (GY/WH), harness side.</li> </ul>  <p>A0034113</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <b>K11</b> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<p><b>K11 CHECK THE A/C COMPRESSOR CLUTCH AIR GAP</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the A/C compressor clutch air gap at 3 equally spaced locations between the clutch hub and the A/C compressor clutch pulley.</li> </ul>  <p>N0043653</p> <ul style="list-style-type: none"> <li>• Is the A/C compressor clutch air gap average greater than 0.026 in (0.65 mm)?</li> </ul>	<p><b>Yes</b> ADJUST the A/C compressor clutch gap. REFER to <u>Air Conditioning (A/C) Clutch Air Gap Adjustment</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new A/C compressor clutch field coil. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p>

K12 CHECK CIRCUIT 1810 (LG/OG) FOR AN OPEN	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Clutch Relay.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C control relay socket pin 5, circuit 1810 (LG/OG) and ground.</li> </ul>  <p>N0051457</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 321 (GY/WH) for an open. TEST the system for normal operation.</p> <p><b>No</b> VERIFY the BJB fuse 11 (15A) is OK. If OK, REPAIR circuit 1810 (LG/OG) for an open. TEST the system for normal operation.</p>
K13 CHECK THE PCM CONNECTION	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Inspect the module connectors for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> </ul> </li> <li>• Connect and correctly seat all the PCM connectors.</li> <li>• Clear the DTCs.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
K14 CHECK THE HVAC MODULE CONNECTION	
<ul style="list-style-type: none"> <li>• Inspect the module connectors for: <ul style="list-style-type: none"> <li>◆ corrosion.</li> <li>◆ pushed-out terminals.</li> <li>◆ damaged terminals.</li> </ul> </li> <li>• Connect and correctly seat all the HVAC module connectors.</li> <li>• Clear the DTCs.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new HVAC module. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test L: The Air Conditioning (A/C) is Always On - A/C Compressor Does Not Cycle**

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

**Normal Operation**

Under normal operation, when A/C is requested, the climate control assembly or HVAC module sends voltage to the A/C cycling switch. The PCM receives input from the A/C cycling switch, when closed (sufficient pressure). The A/C cycling switch is used for A/C compressor cycling. The switch is used by the PCM to turn off the A/C compressor before the line pressures are low enough to drop the evaporator temperature excessively low and freeze the condensation.

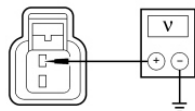
Voltage is provided to the A/C clutch relay switch. When the PCM energizes the relay, voltage is supplied to the A/C clutch from the relay. Ground is supplied for the A/C clutch.

**This pinpoint test is intended to diagnose the following:**

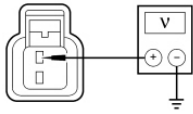
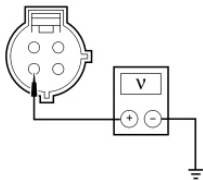
- Wiring, terminals or connectors
- PCM
- A/C clutch relay
- Function selector switch
- HVAC module
- A/C clutch air gap

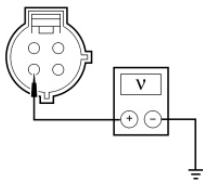
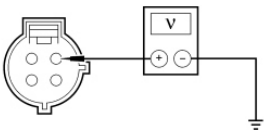
**PINPOINT TEST L: THE AIR CONDITIONING (A/C) IS ALWAYS ON - A/C COMPRESSOR DOES NOT CYCLE**

Test Step	Result / Action to Take
<b>L1 CHECK THE AIR CONDITIONING CYCLING SWITCH (ACCS) PCM PID WITH THE A/C OFF</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: ACCS PCM PID.</li> <li>• Place the function selector switch in the OFF position or press the OFF manual override button on the HVAC module.</li> <li>• <b>Does the ACCS PCM PID read OFF?</b></li> </ul>	<p><b>Yes</b> GO to <u>L2</u> .</p> <p><b>No</b> GO to <u>L4</u> .</p>
<b>L2 CHECK FOR VOLTAGE TO THE A/C COMPRESSOR CLUTCH FIELD COIL</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Compressor Clutch Field Coil C100.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C compressor clutch field coil C100-1, circuit 321 (GY/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>L3</u> .</p> <p><b>No</b> ADJUST the A/C compressor clutch gap. REFER to <u>Air Conditioning (A/C) Clutch Air Gap Adjustment</u> in this section. TEST the system for normal operation.</p>



A0048576

<ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<b>L3 CHECK CIRCUIT 321 (GY/WH) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Clutch Relay.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C compressor clutch field coil C100-1, circuit 321 (GY/WH), harness side and ground.</li> </ul>  <p>A0048576</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 321 (GY/WH) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new A/C clutch relay. CHECK the A/C clutch diode. INSTALL a new diode, if necessary. TEST the system for normal operation.</p>
<b>L4 CHECK CIRCUIT 348 (VT) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Cycling Switch C1081.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C cycling switch C1081-4, circuit 348 (VT), harness side and ground.</li> </ul>  <p>A0040571</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> GO to <u>L5</u> .</p> <p><b>No</b> GO to <u>L6</u> .</p>
<b>L5 CHECK CIRCUIT 348 (VT) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C cycling switch C1081-4, circuit 348 (VT), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 348 (VT) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new function selector switch or HVAC module. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p>

 <p>A0040571</p> <p>• Is any voltage present?</p>	
<p><b>L6 CHECK CIRCUIT 883 (PK/LB) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C cycling switch C1081-1, circuit 883 (PK/LB), harness side and ground.</li> </ul>  <p>A0013801</p> <p>• Is any voltage present?</p>	<p><b>Yes</b> REPAIR circuit 883 (PK/LB) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new PCM. TEST the system for normal operation.</p>

### Pinpoint Test M: The Air Conditioning (A/C) is Always On - A/C Mode Always Commanded ON

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

#### Normal Operation

Under normal operation, when A/C is requested, the climate control assembly or HVAC module sends voltage to the A/C cycling switch. The PCM receives input from the A/C cycling switch, when closed (sufficient pressure). The A/C cycling switch is used for A/C compressor cycling. The switch is used by the PCM to turn off the A/C compressor before the line pressures are low enough to drop the evaporator temperature excessively low and freeze the condensation.

Voltage is provided to the A/C clutch relay switch. When the PCM energizes the relay, voltage is supplied to the A/C clutch from the relay. Ground is supplied for the A/C clutch.

When an A/C request is received by the PCM, the A/C compressor clutch will only be engaged through the A/C clutch relay if all of the following conditions are met:

#### This pinpoint test is intended to diagnose the following:

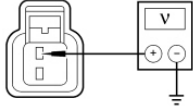
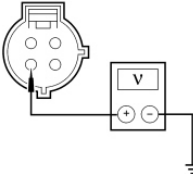
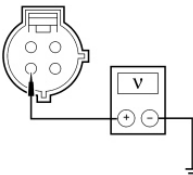
- Wiring, terminals or connectors
- PCM
- A/C clutch relay

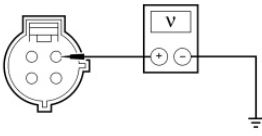


- Function selector switch
- HVAC module
- A/C clutch air gap

**PINPOINT TEST M: THE AIR CONDITIONING (A/C) IS ALWAYS ON - A/C MODE ALWAYS COMMANDED ON**

Test Step	Result / Action to Take
<b>M1 CHECK THE AIR CONDITIONING CYCLING SWITCH (ACCS) PCM PID WITH THE A/C OFF</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: ACCS PCM PID.</li> <li>• Place the function selector switch in the OFF position or press the OFF manual override button on the HVAC module.</li> <li>• <b>Does the ACCS PCM PID read OFF?</b></li> </ul>	<p><b>Yes</b> GO to <u>M2</u> .</p> <p><b>No</b> GO to <u>M4</u> .</p>
<b>M2 CHECK FOR VOLTAGE TO THE A/C COMPRESSOR CLUTCH FIELD COIL</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Compressor Clutch Field Coil C100.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C compressor clutch field coil C100-1, circuit 321 (GY/WH), harness side and ground.</li> </ul> <div> </div> <p>A0048576</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> GO to <u>M3</u> .</p> <p><b>No</b> ADJUST the A/C compressor clutch gap. REFER to <u>Air Conditioning (A/C) Clutch Air Gap Adjustment</u> in this section. TEST the system for normal operation.</p>
<b>M3 CHECK CIRCUIT 321 (GY/WH) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Clutch Relay.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C compressor clutch field coil C100-1, circuit 321 (GY/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 321 (GY/WH) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new A/C clutch relay. CHECK the A/C clutch diode. INSTALL a new diode, if necessary. TEST the system for normal operation.</p>

 <p>A0048576</p> <p>• Is any voltage present?</p>	
<p><b>M4 CHECK CIRCUIT 348 (VT) FOR VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: A/C Cycling Switch C1081.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C cycling switch C1081-4, circuit 348 (VT), harness side and ground.</li> </ul>  <p>A0040571</p> <p>• Is any voltage present?</p>	<p><b>Yes</b> GO to <u>M5</u> .</p> <p><b>No</b> GO to <u>M6</u> .</p>
<p><b>M5 CHECK CIRCUIT 348 (VT) FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C cycling switch C1081-4, circuit 348 (VT), harness side and ground.</li> </ul>  <p>A0040571</p> <p>• Is any voltage present?</p>	<p><b>Yes</b> REPAIR circuit 348 (VT) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new function selector switch or HVAC module. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p>
<p><b>M6 CHECK CIRCUIT 883 (PK/LB) FOR A SHORT TO VOLTAGE</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between A/C cycling switch C1081-1, circuit 883 (PK/LB), harness side and ground.</li> </ul>  <p>A0013801</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 883 (PK/LB) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new PCM. TEST the system for normal operation.</p>
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### Pinpoint Test N: Temperature Control is Inoperative/Does Not Operate Correctly - Manual Climate Control

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

#### Normal Operation

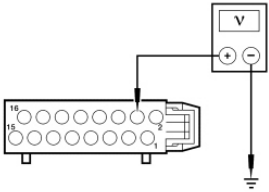
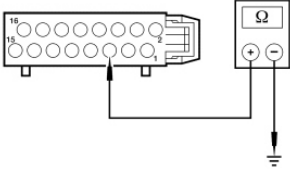
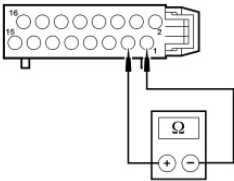
Under normal operation, the temperature blend door actuator is supplied voltage and ground. As the temperature selection changes it varies the voltage to the temperature blend door actuator. The temperature control potentiometer receives voltage from the temperature blend door actuator. Ground for the temperature control potentiometer is supplied from the temperature blend door actuator.

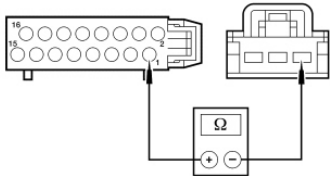
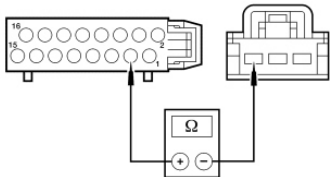
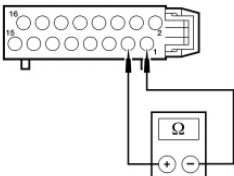
#### This pinpoint test is intended to diagnose the following:

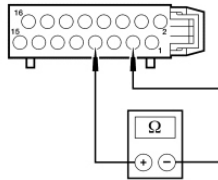
- Fuse
- Wiring, terminals or connectors
- Temperature blend door actuator
- Temperature control potentiometer
- Stuck or bound linkage or door

### PINPOINT TEST N: TEMPERATURE CONTROL IS INOPERATIVE/DOES NOT OPERATE CORRECTLY - MANUAL CLIMATE CONTROL

Test Step	Result / Action to Take
<b>N1 CHECK THE VOLTAGE TO THE TEMPERATURE BLEND DOOR ACTUATOR MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: In-line C237.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between in-line C237-4, circuit 1040 (RD/BK), instrument panel harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>N2</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 17 (10A) is OK. If OK, REPAIR circuit 1040 (RD/BK) for an open. TEST the system for normal operation.</p>

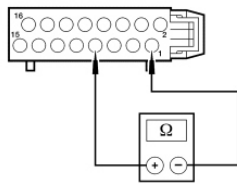
 <p>N0085394</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	
<p><b>N2 CHECK THE GROUND TO THE BLEND DOOR ACTUATOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between in-line C237-5, circuit 57 (BK), instrument panel harness side and ground.</li> </ul>  <p>N0085395</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>N3</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<p><b>N3 CHECK THE TEMPERATURE CONTROL POTENTIOMETER TOTAL RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between in-line C237-1, circuit 436 (RD/LG), instrument panel harness side and in-line C237-3, circuit 600 (DB), instrument panel harness side.</li> </ul>  <p>N0085396</p> <ul style="list-style-type: none"> <li>• Is the resistance between 8,000 and 11,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>N6</u> .</p> <p><b>No</b> If the resistance is greater than 11,000 ohms, GO to <u>N4</u> .</p> <p>If the resistance is less than 8,000 ohms, GO to <u>N5</u> .</p>
<p><b>N4 CHECK CIRCUITS 436 (RD/LG) AND 600 (DB) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Temperature Control Potentiometer C294C.</li> <li>• Measure the resistance between in-line C237-1, circuit 436 (RD/LG), instrument panel harness side and temperature control potentiometer C294C-1, circuit 436 (RD/LG), harness side.</li> </ul>	<p><b>Yes</b> INSTALL a new temperature control potentiometer. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR the affected circuit for an open. TEST the system for normal operation.</p>

 <p>N0085397</p> <ul style="list-style-type: none"> <li>• Measure the resistance between in-line C237-3, circuit 600 (DB), instrument panel harness side and temperature control potentiometer C294C-3, circuit 600 (DB), harness side.</li> </ul>	
 <p>N0085398</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new temperature control potentiometer. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuits 436 (RD/LG) and 600 (DB) for a short together. TEST the system for normal operation.</p>
<p><b>N5 CHECK CIRCUITS 436 (RD/LG) AND 600 (DB) FOR A SHORT TOGETHER</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Temperature Control Potentiometer C294C.</li> <li>• Measure the resistance between in-line C237-1, circuit 436 (RD/LG), instrument panel harness side and in-line C237-3, circuit 600 (DB), instrument panel harness side.</li> </ul>  <p>N0085396</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>N9</u> .</p> <p><b>No</b> If the resistances are greater than 10,000 ohms, GO to <u>N7</u> .</p> <p>If the resistances are less than 50 ohms, GO to <u>N8</u> .</p>
<p><b>N6 CHECK THE TEMPERATURE CONTROL POTENTIOMETER OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Measure the <b>high-side</b> resistance between in-line C237-7, circuit 437 (YE/LG), instrument panel harness side and in-line C237-3, circuit 600 (DB), instrument panel harness side while rotating the temperature control potentiometer between full WARM to full COOL.</li> </ul>	



N0085399

- Measure the **low-side** resistance between in-line C237-7, circuit 437 (YE/LG), instrument panel harness side and in-line C237-1, circuit 436 (RD/LG), instrument panel harness side while rotating the temperature control potentiometer between full WARM to full COOL.

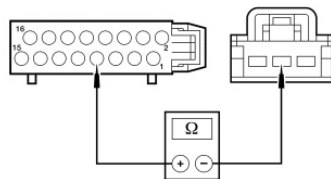


N0085400

- **Do both resistances vary between 50 and 10,000 ohms?**

**N7 CHECK CIRCUIT 437 (YE/LG) FOR AN OPEN**

- Disconnect: Temperature Control Potentiometer C294C.
- Measure the resistance between in-line C237-7, circuit 437 (YE/LG), instrument panel harness side and temperature control potentiometer C294C-2, circuit 437 (YE/LG), harness side.



N0085401

- **Is the resistance less than 5 ohms?**

**N8 CHECK CIRCUITS 437 (YE/LG) AND 600 (DB) OR CIRCUITS 437 (YE/LG) AND 436 (RD/LG) FOR A SHORT TOGETHER**

- Disconnect: Temperature Control Potentiometer C294C.
- Measure the resistance between in-line C237-7, circuit 437 (YE/LG), instrument panel harness side and in-line C237-3, circuit 600 (DB), instrument panel harness side.

**Yes**

INSTALL a new temperature control potentiometer. REFER to [Section 412-01](#) . TEST the system for normal operation.

**No**

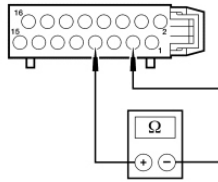
REPAIR circuit 437 (YE/LG) for an open. TEST the system for normal operation.

**Yes**

INSTALL a new temperature control potentiometer. REFER to [Section 412-01](#) . TEST the system for normal operation.

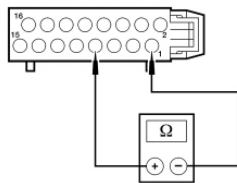
**No**

REPAIR the circuits for a short together. TEST the system for normal operation.



N0085399

- Measure the resistance between in-line C237-7, circuit 437 (YE/LG), instrument panel harness side and in-line C237-1, circuit 436 (RD/LG), instrument panel harness side.

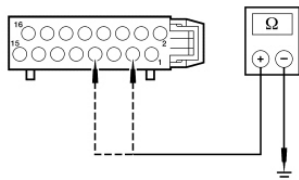


N0085400

- **Is the resistance greater than 10,000 ohms?**

#### **N9 CHECK CIRCUITS 437 (YE/LG) AND 600 (DB) FOR A SHORT TO GROUND**

- Disconnect: Temperature Control Potentiometer C294C.
- Measure the resistances between ground and:
  - ◆ in-line C237-7, circuit 437 (YE/LG), instrument panel harness side.
  - ◆ in-line C237-3, circuit 600 (DB), instrument panel harness side.



N0085402

- **Are the resistances greater than 10,000 ohms?**

#### **N10 CHECK CIRCUITS 436 (RD/LG), 437 (YE/LG) AND 600 (DB) FOR A SHORT TO VOLTAGE**

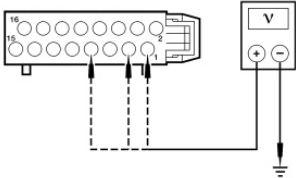
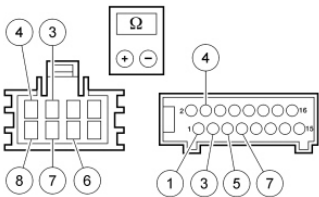
- Ignition ON.
- Measure the voltage between ground and:
  - ◆ in-line C237-7, circuit 437 (YE/LG), instrument panel harness side.
  - ◆ in-line C237-3, circuit 600 (DB), instrument panel harness side.
  - ◆ in-line C237-1, circuit 436 (RD/LG), instrument panel harness side.

**Yes**  
GO to N10 .

**No**  
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

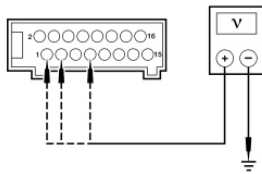
**Yes**  
REPAIR the affected circuit for a short to voltage. TEST the system for normal operation.

**No**  
GO to N11 .

<div><p>N0085403</p><p>• Is any voltage present?</p></div>																				
<p><b>N11 CHECK ACTUATOR CIRCUITS FOR AN OPEN</b></p>																				
<p><b>NOTE:</b> Access to the connector in the following step is difficult. Before performing this step, visually inspect the actuator and its harness for obvious damage. If no damage is evident, proceed with the test.</p> <ul style="list-style-type: none"><li>• Disconnect: Temperature Blend Door Actuator C289.</li><li>• Measure the resistance between the in-line connector, body harness side and temperature blend door actuator, body harness side using the following chart.</li></ul> <table><tr><th>In-line Connector</th><th>Circuit</th><th>Temperature Blend Door Actuator Connector</th></tr><tr><td>C237-1</td><td>436 (RD/LG)</td><td>C289-4</td></tr><tr><td>C237-7</td><td>437 (YE/LG)</td><td>C289-3</td></tr><tr><td>C237-3</td><td>600 (DB)</td><td>C289-6</td></tr><tr><td>C237-5</td><td>245 (BN/LG)</td><td>C289-8</td></tr><tr><td>C237-4</td><td>246 (VT)</td><td>C289-7</td></tr></table> <div><p>N0085404</p><p>• Are the resistances less than 5 ohms?</p></div>		In-line Connector	Circuit	Temperature Blend Door Actuator Connector	C237-1	436 (RD/LG)	C289-4	C237-7	437 (YE/LG)	C289-3	C237-3	600 (DB)	C289-6	C237-5	245 (BN/LG)	C289-8	C237-4	246 (VT)	C289-7	<p><b>Yes</b> GO to <u>N12</u> .</p> <p><b>No</b> REPAIR the affected circuit for an open. TEST the system for normal operation.</p>
In-line Connector	Circuit	Temperature Blend Door Actuator Connector																		
C237-1	436 (RD/LG)	C289-4																		
C237-7	437 (YE/LG)	C289-3																		
C237-3	600 (DB)	C289-6																		
C237-5	245 (BN/LG)	C289-8																		
C237-4	246 (VT)	C289-7																		
<p><b>N12 CHECK CIRCUITS 436 (RD/LG), 437 (YE/LG) AND 600 (DB) FOR A SHORT TO VOLTAGE</b></p>																				
<ul style="list-style-type: none"><li>• Ignition ON.</li><li>• Measure the voltage between ground and:<ul style="list-style-type: none"><li>♦ in-line C237-7, circuit 437 (YE/LG), body harness side.</li><li>♦ in-line C237-3, circuit 600 (DB), body harness side.</li></ul></li></ul>		<p><b>Yes</b> REPAIR the affected circuit for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>N13</u> .</p>																		



- ♦ in-line C237-1, circuit 436 (RD/LG), body harness side.

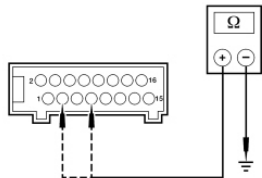


N0085406

- Is any voltage present?

**N13 CHECK CIRCUITS FOR A SHORT TO GROUND**

- Measure the resistances between ground and:
  - ♦ in-line C237-7, circuit 437 (YE/LG), body harness side.
  - ♦ in-line C237-3, circuit 600 (DB), body harness side.



N0085405

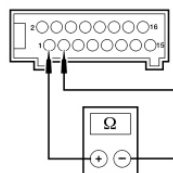
- Are the resistances greater than 10,000 ohms?

**Yes**  
GO to **N14**.

**No**  
REPAIR the affected circuit for a short to ground. TEST the system for normal operation.

**N14 CHECK CIRCUITS FOR A SHORT TOGETHER**

- Ignition OFF.
- Measure the resistance between in-line C237-1, circuit 436 (RD/LG), body harness side and in-line C237-3, circuit 600 (DB), body harness side.

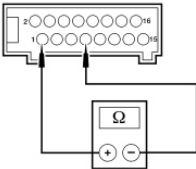
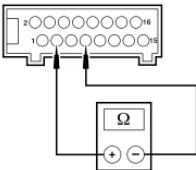


N0085407

- Measure the resistance between in-line C237-7, circuit 437 (YE/LG), body harness side and in-line C237-1, circuit 436 (RD/LG), body harness side.

**Yes**  
GO to **N15**.

**No**  
REPAIR the circuits for a short together. TEST the system for normal operation.

 <p>N0085408</p> <ul style="list-style-type: none"> <li>• Measure the resistance between in-line C237-7, circuit 437 (YE/LG), body harness side and in-line C237-3, circuit 600 (DB), body harness side.</li> </ul>	
 <p>N0085409</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	
<p><b>N15 CHECK FOR A BINDING, STUCK OR BROKEN BLEND DOOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Remove the actuator. Refer to <a href="#">Section 412-01</a>.</li> <li>• Inspect for a binding, stuck or broken blend door or linkage.</li> <li>• <b>Is there a binding, stuck or broken blend door or linkage condition?</b></li> </ul>	<p><b>Yes</b> REPAIR the blend door/linkage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new temperature blend door actuator. REFER to <a href="#">Section 412-01</a>. TEST the system for normal operation.</p>

### Pinpoint Test O: The Blower Motor is Inoperative - Manual Climate Control

Refer to Wiring Diagrams Cell [54](#), Manual Climate Control System for schematic and connector information.

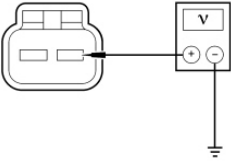
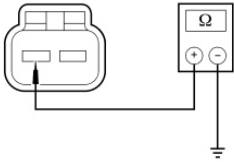
#### Normal Operation

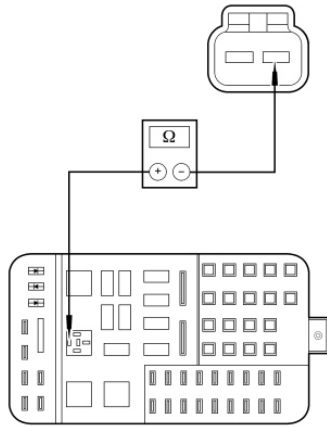
Under normal operation, the blower motor relay coil receives ground. The blower motor relay coil receives voltage from the function selector switch if any position but OFF is selected. The function selector switch is supplied voltage. Voltage is supplied to the relay switch contact. When the relay coil is energized, voltage is delivered to the blower motor. Ground for the blower motor is provided from the blower resistor or the blower switch (HI). The blower resistor and blower switch is grounded.

#### This pinpoint test is intended to diagnose the following:

- Fuse(s)
- Wiring, terminals or connectors
- Blower motor
- Blower motor relay
- Function selector switch

## PINPOINT TEST O: THE BLOWER MOTOR IS INOPERATIVE - MANUAL CLIMATE CONTROL

Test Step	Result / Action to Take
<b>O1 CHECK THE VOLTAGE TO THE BLOWER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Blower Motor C1227.</li> <li>• Ignition ON.</li> <li>• Turn the function selector switch to the FLOOR position.</li> <li>• Turn the blower motor switch to the HI position.</li> <li>• Measure the voltage between blower motor C1227-1, circuit 371 (PK/WH), harness side and ground.</li> </ul>  <p>N0003834</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>O2</u> .</p> <p><b>No</b> GO to <u>O3</u> .</p>
<b>O2 CHECK THE BLOWER MOTOR GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between blower motor C1227-2, circuit 261 (OG/BK), harness side and ground.</li> </ul>  <p>N0003835</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new blower motor. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 261 (OG/BK) for an open. TEST the system for normal operation.</p>
<b>O3 CHECK CIRCUIT 371 (PK/WH) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Relay.</li> <li>• Measure the resistance between blower motor relay socket pin 87, circuit 371 (PK/WH), and blower motor C1227-1, circuit 371 (PK/WH), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>O4</u> .</p> <p><b>No</b> REPAIR circuit 371 (PK/WH) for an open. TEST the system for normal operation.</p>

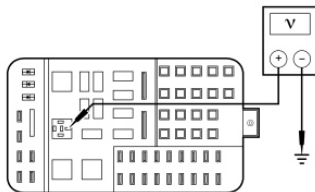


N0051459

- Is the resistance less than 5 ohms?

#### O4 CHECK CIRCUIT 364 (BK/LG) FOR AN OPEN

- Measure the voltage between blower motor relay socket pin 30, circuit 364 (BK/LG) and ground.



N0051460

- Is the voltage 10 volts or greater?

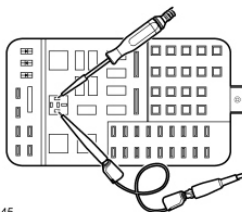
**Yes**  
GO to O5 .

**No**  
VERIFY the Battery Junction Box (BJB) fuse 101 (40A) is OK. If OK, REPAIR circuit 364 (BK/LG) for an open. TEST the system for normal operation.

#### O5 CHECK THE BLOWER MOTOR RELAY

**NOTICE:** The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.

- Ignition ON.
- Connect a 12-volt test light between blower motor relay socket pin 86, circuit 249 (DB/LG), and blower motor relay socket pin 85, circuit 57 (BK).

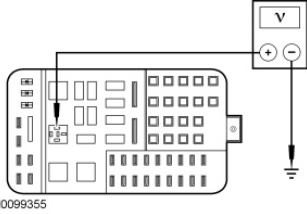
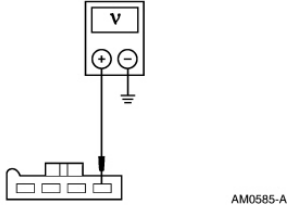


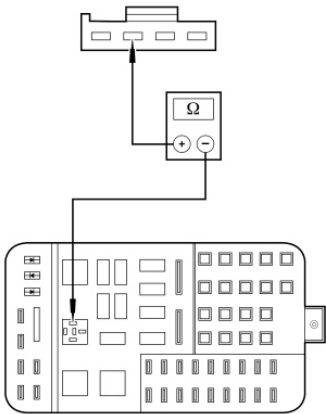
N0098945

- Does the test light illuminate?

**Yes**  
INSTALL a new blower motor relay. TEST the system for normal operation.

**No**  
GO to O6 .

O6 CHECK CIRCUIT 249 (DB/LG) FOR AN OPEN	
<ul style="list-style-type: none"> <li>Measure the voltage between blower motor relay socket pin 86, circuit 249 (DB/LG) and ground.</li> </ul>  <p>N0099355</p> <ul style="list-style-type: none"> <li>Is the voltage 10 volts or greater?</li> </ul>	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>Q7</u>.</p>
O7 CHECK THE VOLTAGE TO THE CLIMATE CONTROL ASSEMBLY	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Climate Control Assembly C294A.</li> <li>Ignition ON.</li> <li>Measure the voltage between climate control assembly C294A-1 circuit 1812 (BN/WH), harness side and ground.</li> </ul>  <p>AM0585-A</p> <ul style="list-style-type: none"> <li>Is the voltage 10 volts or greater?</li> </ul>	<p><b>Yes</b> GO to <u>Q8</u>.</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 15 (10A) is OK. If OK, REPAIR circuit 1812 (BN/WH) for an open. TEST the system for normal operation.</p>
O8 CHECK CIRCUIT 249 (DB/LG) FOR AN OPEN	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Measure the resistance between climate control assembly C294A-3, circuit 249 (DB/LG), harness side and blower motor relay socket pin 86, circuit 249 (DB/LG).</li> </ul>	<p><b>Yes</b> INSTALL a new function selector switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 249 (DB/LG) for an open. TEST the system for normal operation.</p>



- Is the resistance less than 5 ohms?

**Pinpoint Test P: The Blower Motor Does Not Operate Correctly - Manual Climate Control**

Refer to Wiring Diagrams Cell 54 , Manual Climate Control System for schematic and connector information.

**Normal Operation**

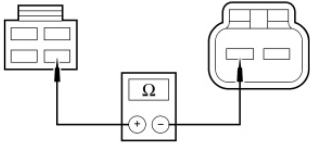
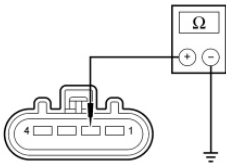
Under normal operation, the blower motor is provided a ground through the entire blower resistor in the lowest blower setting. In MED-LO and MED-HI, the resistor gets a ground from the blower motor switch. In HI, the blower motor is grounded directly through the blower motor switch. The blower switch is provided a ground.

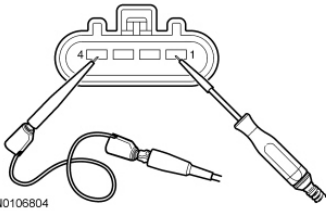
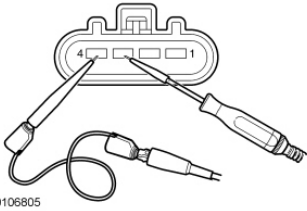
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Blower motor switch
- Blower motor resistor

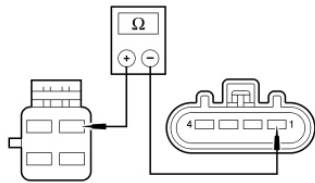
**PINPOINT TEST P: THE BLOWER MOTOR DOES NOT OPERATE CORRECTLY - MANUAL CLIMATE CONTROL**

Test Step	Result / Action to Take
<b>P1 CHECK THE BLOWER MOTOR OPERATION</b>	
<ul style="list-style-type: none"><li>• Ignition ON.</li><li>• Turn the function selector switch to the FLOOR position.</li><li>• Select all blower speed positions.</li><li>• <b>Does the blower motor operate in any position?</b></li></ul>	<p><b>Yes</b> If the blower motor does not operate in HI setting only, GO to <u>P2</u> .</p> <p>If the blower motor does not operate in LO setting only, GO to <u>P3</u> .</p> <p>If the blower motor does not operate in MED-LO or MED-HI setting only, GO to <u>P4</u> .</p> <p>If the blower motor operates</p>

	<p>in HI setting only, GO to <b>P6</b>.</p> <p>If the blower motor operates in LO setting only, GO to <b>P7</b>.</p> <p>For all other symptoms, GO to <b>P8</b>.</p> <p><b>No</b> GO to Pinpoint Test Q.</p>
<b>P2 CHECK THE BLOWER MOTOR RESISTOR CIRCUIT 261 (OG/BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Switch C294B.</li> <li>• Disconnect: Blower Motor C1227.</li> <li>• Measure the resistance between blower motor switch C294B-3, circuit 261 (OG/BK), harness side and blower motor C1227-2, circuit 261 (OG/BK), harness side.</li> </ul>  <p>N0003836</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new blower motor switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 261 (OG/BK) for an open. TEST the system for normal operation.</p>
<b>P3 CHECK BLOWER MOTOR RESISTOR GROUND CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Resistor C1349.</li> <li>• Measure the resistance between blower motor resistor C1349-2, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0003841</p> <ul style="list-style-type: none"> <li>• Are the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new blower motor resistor. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<b>P4 CHECK THE BLOWER MOTOR SWITCH</b>	

<p><b>NOTICE:</b> The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Resistor C1349.</li> <li>• Ignition ON.</li> </ul> <p><b>For MED-LO inoperative</b></p>  <p>N0106804</p> <ul style="list-style-type: none"> <li>• <b>For MED-LO inoperative :</b> With the blower motor switch in the MED-LO speed position, connect a 12-volt test light between blower motor resistor C1349-4, circuit 261 (OG/BK), harness side and blower motor resistor C1349-1, circuit 754 (LG/WH), harness side.</li> </ul> <p><b>For MED-HI inoperative</b></p>  <p>N0106805</p> <ul style="list-style-type: none"> <li>• <b>For MED-HI inoperative :</b> With the blower motor switch in the MED-HI speed position, connect a 12-volt test light between blower motor resistor C1349-4, circuit 261 (OG/BK), harness side and blower motor resistor C1349-3, circuit 754 (YE/RD), harness side.</li> <li>• <b>Does the test light illuminate?</b></li> </ul>	<p><b>Yes</b> INSTALL a new blower motor resistor. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>P5</u> .</p>
<p><b>P5 CHECK CIRCUITS 752 (YE/RD) AND 754 (LG/WH) FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Switch C294B.</li> <li>• Disconnect: Blower Motor Resistor C1349.</li> </ul> <p><b>For MED-LO inoperative</b></p>	<p><b>Yes</b> CARRY OUT the Blower Motor Resistor component test in this section. If the resistor tests OK, INSTALL a new blower motor switch. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the affected circuit for an open. TEST the</p>

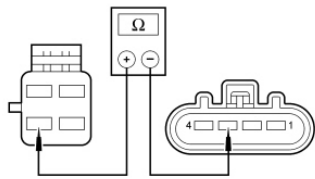




N0106806

- **For MED-LO inoperative** : Measure the resistance between blower motor switch C294B-1, circuit 754 (LG/WH), harness side and blower motor resistor C1349-1, circuit 754 (LG/WH), harness side.

**For MED-HI inoperative**



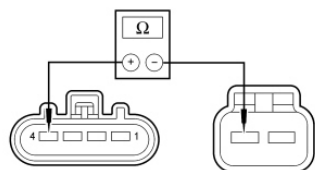
N0106807

- **For MED-HI inoperative** : Measure the resistance between blower motor switch C294B-4, circuit 752 (YE/RD), harness side and blower motor resistor C1349-3, circuit 752 (YE/RD), harness side.
- **Are the resistances less than 5 ohms?**

system for normal operation.

#### **P6 CHECK THE BLOWER MOTOR RESISTOR CIRCUIT 261 (OG/BK) FOR AN OPEN**

- Ignition OFF.
- Disconnect: Blower Motor Resistor C1349.
- Disconnect: Blower Motor C1227.
- Measure the resistance between blower motor resistor C1349-4, circuit 261 (OG/BK), harness side and blower motor C1227-2, circuit 261 (OG/BK).



N0003842

- **Are the resistances less than 5 ohms?**

**Yes**

INSTALL a new blower motor resistor. TEST the system for normal operation.

**No**

REPAIR circuit 261 (OG/BK) for an open. TEST the system for normal operation.

#### **P7 CHECK CIRCUIT 57 (BK) FOR AN OPEN**

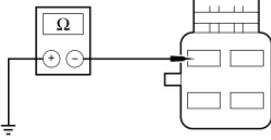
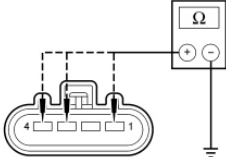
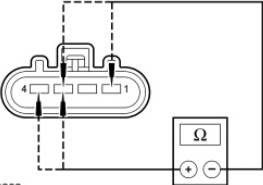
- Measure the resistance between blower motor switch C294B-2, circuit 57 (BK), harness side and ground.

**Yes**

INSTALL a new blower motor switch. TEST the system for normal operation.

**No**

REPAIR circuit 57 (BK) for an open. TEST the system

 <p>A0013882</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	for normal operation.
<b>P8 CHECK CIRCUITS 261 (OG/BK), 752 (YE/RD) AND 754 (LG/WH) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor C1227.</li> <li>• Disconnect: Blower Motor Switch C294B.</li> <li>• Disconnect: Blower Motor Resistor C1349.</li> <li>• Measure the resistance between ground and blower motor resistor:           <ul style="list-style-type: none"> <li>◆ C1349-4, circuit 261 (OG/BK), harness side.</li> <li>◆ C1349-3, circuit 752 (YE/RD), harness side.</li> <li>◆ C1349-1, circuit 754 (LG/WH), harness side.</li> </ul> </li> </ul>  <p>N0003843</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>P9</u> .</p> <p><b>No</b> REPAIR the affected circuit for a short to ground. TEST the system for normal operation.</p>
<b>P9 CHECK THE BLOWER MOTOR CIRCUITS FOR SHORTS TOGETHER</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between blower motor resistor:           <ul style="list-style-type: none"> <li>◆ C1349-4, circuit 261 (OG/BK), harness side and C1349-3, circuit 752 (YE/RD), harness side.</li> <li>◆ C1349-4, circuit 261 (OG/BK), harness side and C1349-1, circuit 754 (LG/WH), harness side.</li> <li>◆ C1349-3, circuit 752 (YE/RD), harness side and C1349-1, circuit 754 (LG/WH), harness side.</li> </ul> </li> </ul>  <p>N0106808</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new blower motor switch. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR the affected circuits. TEST the system for normal operation.</p>

### Pinpoint Test Q: The Blower Motor is Inoperative - EATC

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

For MED-HI inoperative

**Normal Operation**

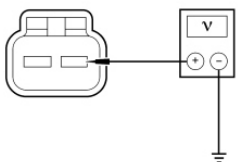
Under normal operation, the blower motor relay coil and switch contact receive. The coil receives ground from the HVAC module if any position but OFF is selected. When the relay coil is energized, voltage is delivered to the blower motor from the relay. Ground for the motor is provided from the blower motor speed control. Ground is provided for the blower motor speed control.

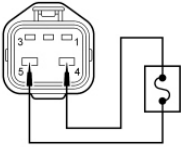
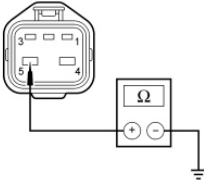
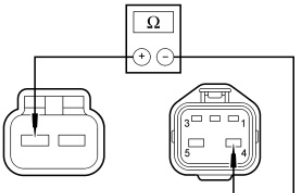
The blower motor speed control receives a 1-2 volt signal from the HVAC module to determine the desired blower motor speed. The HVAC module receives a feedback voltage from the blower motor speed control to determine actual blower motor speed. When the highest blower motor setting is selected, the HVAC module sends 12 volts to the blower motor speed control.

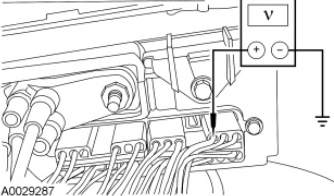
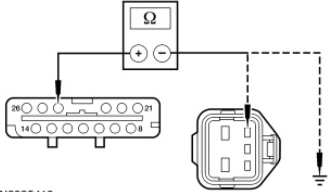
**This pinpoint test is intended to diagnose the following:**

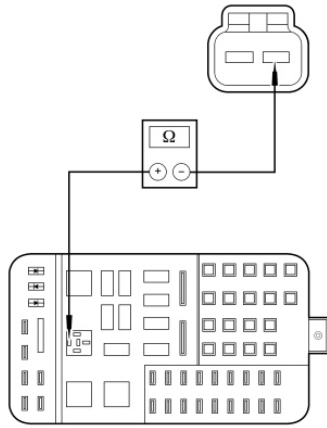
- Fuse(s)
- Wiring, terminals or connectors
- Blower motor
- Blower motor relay
- Blower motor control module
- HVAC module

**PINPOINT TEST Q: THE BLOWER MOTOR IS INOPERATIVE - EATC**

Test Step	Result / Action to Take
<b>Q1 VERIFY THE BLOWER MOTOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Press the PANEL button on the HVAC module. Adjust the blower motor setting to LO and then to HI.</li> <li>• <b>Is the blower motor inoperative in all settings?</b></li> </ul>	<b>Yes</b> GO to <u>Q2</u> .  <b>No</b> GO to Pinpoint Test <u>R</u> .
<b>Q2 CHECK FOR VOLTAGE TO THE BLOWER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor C1227.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between blower motor C1227-1, circuit 371 (PK/WH), harness side and ground.</li> </ul> <div style="text-align: center;">  <p>N0003834</p> </div> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<b>Yes</b> GO to <u>Q3</u> .  <b>No</b> GO to <u>Q8</u> .
<b>Q3 CHECK THE BLOWER MOTOR</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Blower Motor C1227.</li> <li>• Disconnect: Blower Motor Speed Control C1308.</li> <li>• Connect a fused jumper lead between blower motor speed control C1308-4, circuit 515 (OG/RD), harness side and C1308-5, circuit 57 (BK), harness side.</li> </ul>  <p>A0032579</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Does the blower motor operate?</li> </ul>	<p><b>Yes</b> GO to <u>Q6</u> .</p> <p><b>No</b> GO to <u>Q4</u> .</p>
<b>Q4 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Remove the fused jumper lead from blower motor speed control C1308.</li> <li>• Measure the resistance between blower motor speed control C1308-5, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0032576</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>Q5</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<b>Q5 CHECK CIRCUIT 515 (OG/RD) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Blower Motor C1227.</li> <li>• Measure the resistance between blower motor C1227-2, circuit 515 (OG/RD), harness side and blower motor speed control C1308-4, circuit 515 (OG/RD), harness side.</li> </ul>  <p>N0003838</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new blower motor. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 515 (OG/RD) for an open. TEST the system for normal operation.</p>
<b>Q6 CHECK THE HVAC MODULE OUTPUT</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Remove the fused jumper lead from the blower motor speed control C1308.</li> <li>• Connect: Blower Motor Speed Control C1308.</li> <li>• Ignition ON.</li> <li>• Adjust the blower motor speed to HI.</li> <li>• Measure the voltage between HVAC module C228B-24, circuit 754 (LG/WH), harness side and ground by back-probing the HVAC module C228B.</li> </ul>  <p>A0029287</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage within 2 volts of battery voltage?</b></li> </ul>	<p><b>Yes</b> GO to <u>Q7</u> .</p> <p><b>No</b> INSTALL a new HVAC module. TEST the system for normal operation.</p>
<b>Q7 CHECK CIRCUIT 754 (LG/WH) FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Speed Control C1308.</li> <li>• Disconnect: HVAC Module C228B.</li> <li>• Measure the resistance between:             <ul style="list-style-type: none"> <li>◆ HVAC module C228B-24, circuit 754 (LG/WH), harness side and blower motor speed control C1308-3, circuit 754 (LG/WH), harness side.</li> <li>◆ HVAC module C228B-24, circuit 754 (LG/WH), harness side and ground.</li> </ul> </li> </ul>  <p>N0085410</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms between the HVAC module and the blower motor speed control and greater than 10,000 ohms between the HVAC module and ground?</b></li> </ul>	<p><b>Yes</b> INSTALL a new blower motor speed control. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 754 (LG/WH) for an open or short to ground. TEST the system for normal operation.</p>
<b>Q8 CHECK CIRCUIT 371 (PK/WH) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Relay.</li> <li>• Measure the resistance between blower motor relay socket pin 87, circuit 371 (PK/WH) and blower motor C1227-1, circuit 371 (PK/WH), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>Q9</u> .</p> <p><b>No</b> REPAIR circuit 371 (PK/WH) for an open. TEST the system for normal operation.</p>

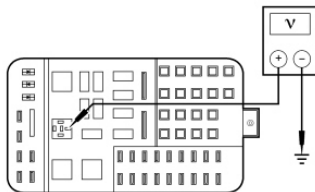


N0051459

- Is the resistance less than 5 ohms?

#### Q9 CHECK CIRCUIT 364 (BK/LG) FOR AN OPEN

- Measure the voltage between blower motor relay socket pin 30, circuit 364 (BK/LG) and ground.



N0051460

- Is the voltage 10 volts or greater?

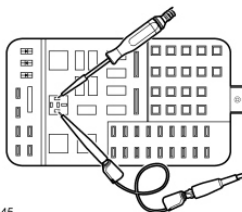
**Yes**  
GO to Q10 .

**No**  
VERIFY the Battery Junction Box (BJB) fuse 101 (40A) is OK. If OK, REPAIR circuit 364 (BK/LG) for an open. TEST the system for normal operation.

#### Q10 CHECK THE BLOWER MOTOR RELAY

**NOTICE:** The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.

- Ignition ON.
- Connect a 12-volt test light between blower motor relay socket pin 86, circuit 1812 (BN/WH) and blower motor relay socket pin 85, circuit 57 (BK).

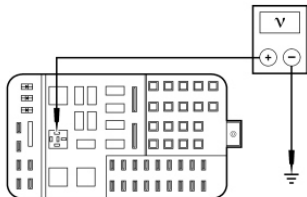


N0098945

- Does the test light illuminate?

**Yes**  
INSTALL a new blower motor relay. TEST the system for normal operation.

**No**  
GO to Q11 .

Q11 CHECK CIRCUIT 1812 (BN/WH) FOR AN OPEN	
<ul style="list-style-type: none"> <li>• Measure the voltage between blower motor relay socket pin 86, circuit 1812 (BN/WH) and ground.</li> </ul>  <p>N0099355</p> <ul style="list-style-type: none"> <li>• Is the voltage 10 volts or greater?</li> </ul>	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 15 (10A) is OK. If OK, REPAIR circuit 1812 (BN/WH) for an open. TEST the system for normal operation.</p>

### Pinpoint Test R: The Blower Motor Does Not Operate Correctly - EATC

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

#### Normal Operation

Under normal operation, the blower motor relay coil and switch contact receive. The coil receives ground from the HVAC module if any position but OFF is selected. When the relay coil is energized, voltage is delivered to the blower motor from the relay. Ground for the motor is provided from the blower motor speed control. Ground is provided for the blower motor speed control.

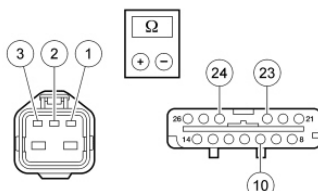
The blower motor speed control receives a 1-2 volt signal from the HVAC module to determine the desired blower motor speed. The HVAC module receives a feedback voltage from the blower motor speed control to determine actual blower motor speed. When the highest blower motor setting is selected, the HVAC module sends 12 volts to the blower motor speed control.

#### This pinpoint test is intended to diagnose the following:

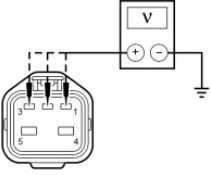
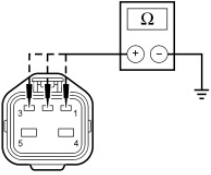
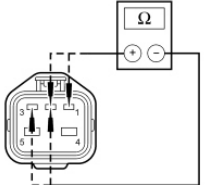
- Wiring, terminals or connectors
- Blower motor control module
- HVAC module

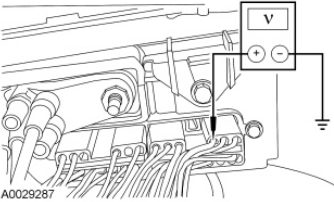
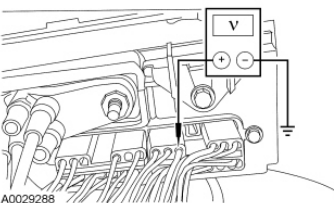
### PINPOINT TEST R: THE BLOWER MOTOR DOES NOT OPERATE CORRECTLY - EATC

Test Step	Result / Action to Take
<b>R1 CHECK CIRCUIT 515 (OG/RD) FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Blower Motor Speed Control C1308.</li> <li>• Ignition ON.</li> <li>• Press the PANEL button on the HVAC module.</li> <li>• <b>Does the blower motor operate?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 515 (OG/RD) for a short to ground. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>R2</u> .</p>
<b>R2 CHECK THE BLOWER MOTOR SPEED CONTROL</b>	

<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Connect: Blower Motor Speed Control C1308.</li><li>• Disconnect: HVAC Module C228B.</li><li>• Ignition ON.</li><li>• <b>Does the blower motor operate?</b></li></ul>	<p><b>Yes</b> INSTALL a new blower motor speed control. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>R3</u> .</p>												
<b>R3 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR AN OPEN</b>													
<div><ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Blower Motor Speed Control C1308.</li><li>• Measure the resistance between the blower motor speed control, harness side and Electronic Automatic Temperature Control (EATC), harness side using the following chart.</li></ul><table><thead><tr><th>Blower Motor Speed Control Connector</th><th>Circuit</th><th>EATC Connector</th></tr></thead><tbody><tr><td>C1308-1</td><td>260 (RD/OG)</td><td>C228B-10</td></tr><tr><td>C1308-2</td><td>752 (YE/RD)</td><td>C228B-23</td></tr><tr><td>C1308-3</td><td>754 (LG/WH)</td><td>C228B-24</td></tr></tbody></table><div><p>N0085411</p></div><ul style="list-style-type: none"><li>• <b>Are the resistances less than 5 ohms?</b></li></ul></div>	Blower Motor Speed Control Connector	Circuit	EATC Connector	C1308-1	260 (RD/OG)	C228B-10	C1308-2	752 (YE/RD)	C228B-23	C1308-3	754 (LG/WH)	C228B-24	<p><b>Yes</b> GO to <u>R4</u> .</p> <p><b>No</b> REPAIR the affected circuit for an open. TEST the system for normal operation.</p>
Blower Motor Speed Control Connector	Circuit	EATC Connector											
C1308-1	260 (RD/OG)	C228B-10											
C1308-2	752 (YE/RD)	C228B-23											
C1308-3	754 (LG/WH)	C228B-24											
<b>R4 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR A SHORT TO VOLTAGE</b>													
<div><ul style="list-style-type: none"><li>• Ignition ON.</li><li>• Measure the voltage between blower motor speed control:<ul style="list-style-type: none"><li>◆ C1308-1, circuit 260 (RD/OG), harness side and ground.</li><li>◆ C1308-2, circuit 752 (YE/RD), harness side and ground.</li><li>◆ C1308-3, circuit 754 (LG/WH), harness side and ground.</li></ul></li></ul></div>	<p><b>Yes</b> REPAIR the affected circuit for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>R5</u> .</p>												

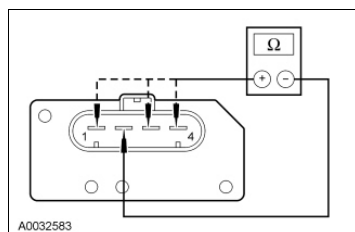


 <p>A003862</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<p><b>R5 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between blower motor speed control:           <ul style="list-style-type: none"> <li>◆ C1308-1, circuit 260 (RD/OG), harness side and ground.</li> <li>◆ C1308-2, circuit 752 (YE/RD), harness side and ground.</li> <li>◆ C1308-3, circuit 754 (LG/WH), harness side and ground.</li> </ul> </li> </ul>  <p>A003863</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>R6</u> .</p> <p><b>No</b> REPAIR the affected circuit for a short to ground. TEST the system for normal operation.</p>
<p><b>R6 CHECK THE BLOWER MOTOR SPEED CONTROL CIRCUITS FOR SHORTS</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between blower motor speed control:           <ul style="list-style-type: none"> <li>◆ C1308-2, circuit 752 (YE/RD), harness side and C1308-3, circuit 754 (LG/WH), harness side.</li> <li>◆ C1308-2, circuit 752 (YE/RD), harness side and C1308-1, circuit 260 (RD/OG), harness side.</li> <li>◆ C1308-3, circuit 754 (LG/WH), harness side and C1308-1, circuit 260 (RD/OG), harness side.</li> </ul> </li> </ul>  <p>A003864</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>R7</u> .</p> <p><b>No</b> REPAIR the affected circuits. TEST the system for normal operation.</p>
<p><b>R7 CHECK THE HVAC MODULE HIGH BLOWER OUTPUT</b></p>	

<ul style="list-style-type: none"> <li>• Connect: HVAC Module C228B.</li> <li>• Connect: Blower Motor Speed Control C1308.</li> <li>• Ignition ON.</li> <li>• Adjust the blower motor speed to HI.</li> <li>• Measure the voltage between HVAC module C228B-24, circuit 754 (LG/WH), harness side and ground by back-probing the HVAC module C228B.</li> </ul>  <p>A0029287</p> <ul style="list-style-type: none"> <li>• Is the voltage within 2 volts of battery voltage?</li> </ul>	<p><b>Yes</b> GO to <b>R8</b> .</p> <p><b>No</b> INSTALL a new HVAC module. TEST the system for normal operation.</p>
<p><b>R8 CHECK THE HVAC MODULE BLOWER CONTROL OUTPUT</b></p>	
<ul style="list-style-type: none"> <li>• Adjust the blower motor speed to LO.</li> <li>• Measure the voltage between HVAC module C228B-23, circuit 752 (YE/RD), harness side and ground by back-probing the HVAC module C228B.</li> </ul>  <p>A0029288</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 1 volt?</li> </ul>	<p><b>Yes</b> INSTALL a new blower motor speed control. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new HVAC module. TEST the system for normal operation.</p>

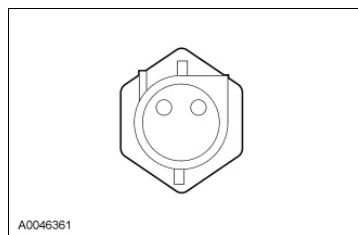
## Component Tests

### Resistor - Blower Motor

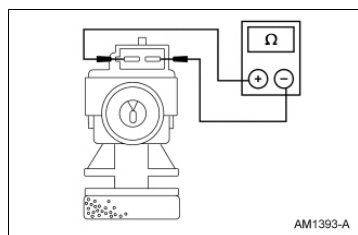


Blower Motor Resistor Pins	Resistance
4 and 2	2.0-2.6 ohms
2 and 3	0.2-0.4 ohm

2 and 1	0.8-1.1 ohm
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**Temperature Sensor - Ambient**

Ambient Temperature	Resistance
10-20°C (50-68°F)	37,000-58,000 ohms
20-30°C (68-86°F)	24,000-37,000 ohms
30-40°C (86-104°F)	16,000-24,000 ohms

**Temperature Sensor - In-Vehicle**

Temperature	Resistance
10-20°C (50-68°F)	37,000-58,000 ohms
20-30°C (68-86°F)	24,000-37,000 ohms
30-40°C (86-104°F)	16,000-24,000 ohms

**Heater Core**

1. **NOTE:** If a heater core leak is suspected, the heater core must be tested by carrying out the Plugged Heater Core Component Test before the Heater Core - Pressure Test. Carry out a system inspection by checking the heater system thoroughly as follows:

Inspect for evidence of coolant leakage at the heater water hose to heater core attachments. A coolant leak in the heater water hose could follow the heater core tube to the heater core and appear as a leak in the heater core.

2. **NOTE:** Spring-type clamps are installed as original equipment. Installation and overtightening of non-specification clamps can cause leakage at the heater water hose connection and damage the heater core.

Check the integrity of the heater water hose clamps.

### Heater Core - Plugged

1. Check to see that the engine coolant is at the correct level.
2. Start the engine and turn on the heater.
3. When the engine coolant reaches operating temperature, feel the heater core outlet hose to see if it is hot.

If it is not hot:

- the heater core may have an air pocket.
- the heater core may be plugged.
- the thermostat is not working correctly.

### Heater Core - Pressure Test

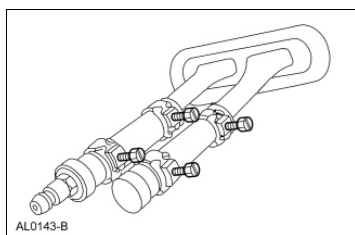
**⚠ WARNING:** Before disconnecting any heater water hoses, shut OFF the engine and wait until engine is fully cool. Failure to comply with this warning may result in serious injury or burns from hot liquid escaping from the engine cooling system.

Use the Radiator/Heater Core Pressure Tester to carry out the pressure test.

1. **NOTE:** Due to space limitations, a bench test may be necessary for pressure testing.

Drain the coolant from the cooling system.

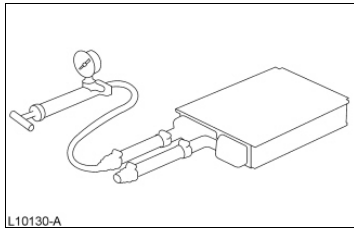
2. Disconnect the heater water hoses from the heater core. Refer to [Section 412-01](#) .
3. Install a short piece of heater water hose, approximately 101 mm (4 in) long on each heater core tube.
4. Fill the heater core and heater water hoses with water and install Plug BT-7422-B and adapter BT-7422-A from the Radiator/Heater Core Pressure Tester in the heater water hose ends. Secure the heater water hoses, plug and adapter with hose clamps.



5. Attach the pump and gauge assembly from the Radiator/Heater Core Pressure Tester to the adapter.
6. Close the bleed valve at the base of the gauge. Pump 138 kPa (20 psi) of air pressure into the heater core.
7. Observe the pressure gauge for a minimum of 3 minutes.
8. If the pressure drops, check the heater water hose connections to the core tubes for leaks. If the heater water hoses do not leak, remove the heater core from the vehicle and carry out the bench test.

### Heater Core - Bench Test

1. Remove the heater core from the vehicle. Refer to Section 412-01 .
2. Drain all of the coolant from the heater core.
3. Connect the 101 mm (4 in) test heater water hoses with plug and adapter to the core tubes. Then connect the Radiator/Heater Core Pressure Tester to the adapter.
4. Apply 138 kPa (20 psi) of air pressure to the heater core. Submerge the heater core in water.
5. If a leak is observed, install a new heater core.



### A/C Evaporator/Condenser Core - On Vehicle Leak Test

1. Recover the refrigerant. Refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
2. **NOTE:** DO NOT leak test an A/C evaporator core with the suction accumulator/drier attached to the core tubes.

Disconnect the suspect A/C evaporator core or A/C condenser core from the A/C system. Refer to Section 412-01 .

3. Clean the spring lock couplings. Refer to Spring Lock Coupling in this section.
4. Connect the appropriate test fittings from the R-12/R-134a Air Conditioning Test Fitting Set to the evaporator or condenser tube connections.
5. **NOTE:** The automatic shut-off valves on some gauge set hoses do not open when connected to the test fittings. If available, use hoses without shut-off valves. If hoses with shut-off valves are used, make sure the valve opens when attached to the test fittings or install an adapter which will activate the valve. The test is not valid if the shut-off valve does not open.

Connect the red and blue hoses from the R-134a Manifold Gauge Set to the test fittings on the A/C evaporator core or A/C condenser core. Connect the yellow hose to a known good vacuum pump.

6. Open both gauge set valves and start the vacuum pump. Allow the vacuum pump to operate for a minimum of 45 minutes after the gauge set low pressure gauge indicates 101 kPa (30 in-Hg). The 45 minute evacuation is necessary to remove any refrigerant from oil left in the A/C evaporator core or A/C condenser core. If the refrigerant is not completely removed from the oil, outgassing will degrade the vacuum and appear as a refrigerant leak.
7. If the low pressure gauge reading will not drop to 101 kPa (30 in-Hg) when the valves on the gauge and manifold set are open and the vacuum pump is operating, close the gauge set valves and observe the low pressure gauge. If the pressure rises rapidly to zero, a large leak is indicated. Recheck the test fitting connections and gauge set connections before installing a new A/C evaporator core or A/C condenser core.

8. After evacuating for 45 minutes, close the gauge set valves and stop the vacuum pump. Observe the low pressure gauge; it should remain at the 101 kPa (30 in-Hg) mark.
  - If the low pressure gauge reading rises 34 or more kPa (10 or more in-Hg) of vacuum from the 101 kPa (30 in-Hg) position in 10 minutes, a leak is indicated.
  - If a very small leak is suspected, wait 30 minutes and observe the vacuum gauge.
  - If a small amount of vacuum is lost, operate the vacuum pump with gauge valves open for an additional 30 minutes to remove any remaining refrigerant from the oil in the A/C evaporator core or A/C condenser core. Then recheck for loss of vacuum.
  - If a very small leak is suspected, allow the system to set overnight with vacuum applied and check for vacuum loss.
9. If the A/C evaporator core or A/C condenser core does leak, as verified by the above procedure, install a new A/C evaporator core or A/C condenser core. Refer to Section 412-01 .


### **A/C Compressor - External Leak Test**

1. Install the A/C Pressure Test Adapter on the rear head of the A/C compressor, using the existing retaining bolts.
  2. Connect the high- and low-pressure lines of a manifold gauge set or a refrigerant recovery/recycling station such as the R-134a A/C Service Center to the corresponding fittings on the A/C Pressure Test Adapter.
  3. Attach the center hose of the manifold gauge set to a refrigerant container standing in an upright position.
  4. Hand-rotate the compressor shaft 10 complete revolutions to distribute the oil inside the A/C compressor.
  5. Open the low-pressure gauge valve, the high-pressure gauge valve and the valve on the refrigerant container to allow the refrigerant vapor to flow into the A/C compressor.
  6. Using the Automatic Calibration Halogen Leak Detector, check the entire A/C compressor for leaks.
  7. If an external leak is found, install a new A/C compressor. Refer to Section 412-01 .
  8. When the leak test is complete, recover the refrigerant from the compressor.
-



## Spring Lock Coupling

### Special Tool(s)

 ST2352-A	Remover, Refrigerant Coupling Spring 412-039 (T84L-19623-B)
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### Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

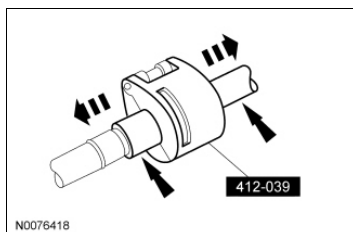
### Disconnect

**NOTE:** If a leak has been found at a spring lock coupling, inspect the O-ring sealing surfaces on the male and female sides of the fitting for damage or scratches. Replace the affected component if damage is identified. If no damage is present, thoroughly clean both sides of the fitting using a suitable non-abrasive cloth, lubricate with PAG oil and install new O-ring seals. Due to subtle differences in O-ring sizes, it is critical for leak prevention that the correct O-ring seal be identified. Refer to the Ford Catalog Advantage™ or equivalent for the specific vehicle and application. When repairs are complete, leak test the spring lock coupling to verify the repair.

1. Remove the spring lock coupling clip, if equipped.
2. **NOTICE:** Do not use metal tools to remove the O-ring seals. They may cause axial scratches across the O-ring seal grooves, resulting in refrigerant leaks.

Push the Refrigerant Coupling Spring Remover into the cage opening to release the female fitting from the spring lock coupling spring and pull the fitting apart.

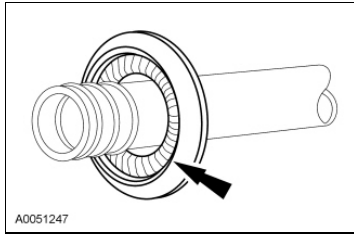
- Remove the O-ring seals using a non-metallic tool.



3. **NOTICE:** Do not use a screwdriver or similar tool to remove the Air Conditioning (A/C) tube lock coupling spring; this may cause axial scratches across the O-ring seal grooves resulting in refrigerant leaks.

Remove the spring lock coupling spring with a small hooked wire.

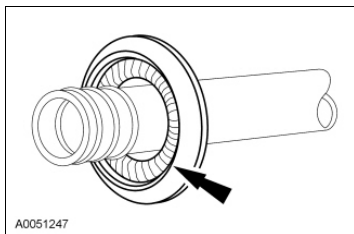




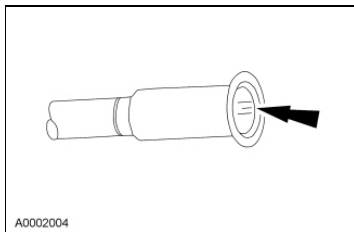
## Connect

**NOTICE:** It is imperative that the sealing surface of the spring lock coupling and O-ring seal be clean and completely free from debris. To prevent contamination, only new PAG oil should be used as an O-ring seal lubricant. Contamination from used PAG oil, residual PAG oil from inside the refrigerant system or a failure to thoroughly clean the fitting sealing surface will interrupt the O-ring seal-to-fitting sealing surface and cause refrigerant system leaks.

1. Install the spring lock coupling spring.

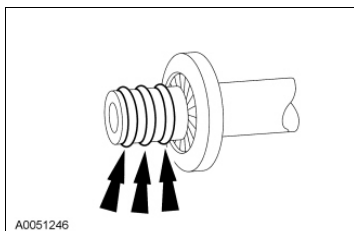


2. Lubricate the inside of the coupling with PAG oil.

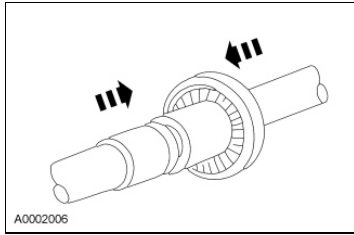


3. **NOTICE:** Use only the new O-ring seals. The use of any O-ring seals other than those specified in the Ford Catalog Advantage™ or equivalent may result in intermittent leakage during vehicle operation.

Install the O-ring seals.



4. Connect the spring lock coupling fittings with a twisting motion until the spring lock coupling spring snaps over the flared end of the female fitting.







5. Install the spring lock coupling clip.

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**Refrigerant System Tests**

## Special Tool(s)

	R-134a Manifold Gauge Set 023-00047 or equivalent
	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 023-00181 or equivalent
	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 199-00067 or equivalent
	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 265-00012 or equivalent

**Procedure 1 - Ambient Temperature at or Below 38°C (100°F)**

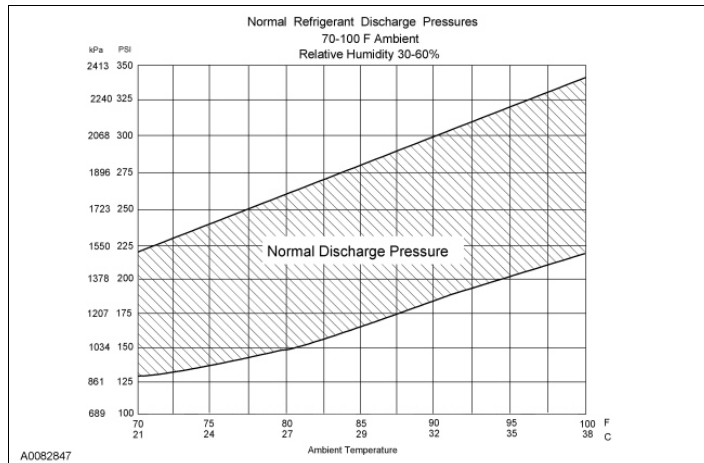
**NOTE:** The system performance can be evaluated and diagnosed by analysis of the compressor suction and discharge pressures. The following procedure is used to determine if the system is operating at normal pressures.

**NOTE:** The procedure varies depending on the ambient (shop) temperature. If the ambient temperature is 38°C (100°F) or lower, follow Procedure 1. If the ambient temperature is over 38°C (100°F), follow Procedure 2.

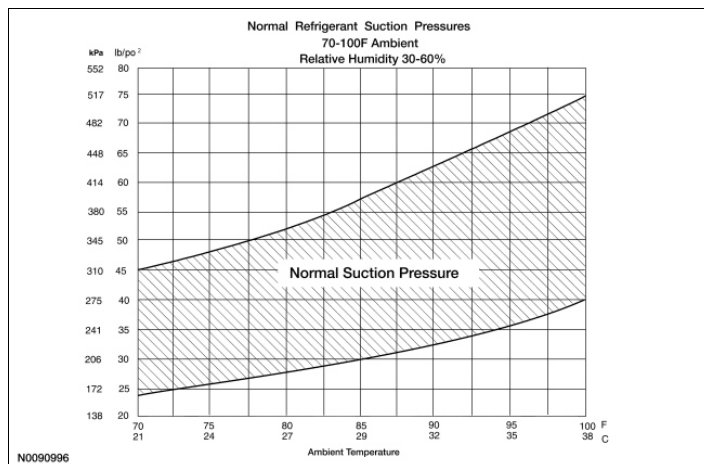
**NOTE:** If the A/C compressor cycles at any time during this test, refer to the diagnostic table.

1. Drive the vehicle or run the engine until it reaches normal operating temperature.
2. Connect a R-134a Manifold Gauge Set or R-134a Refrigerant Management Machine with high-pressure and low-pressure gauges to the refrigerant system.
3. Set the climate controls.
  - If equipped with manual climate control, set the A/C controls for normal A/C-PANEL mode, full COOL temperature, FRESH air, HI blower. If the vehicle has a fresh air/recirc button, set it to FRESH. If the vehicle has an A/C switch or compressor on switch, set it to A/C ON.
  - If equipped with Electronic Automatic Temperature Control (EATC), set temperature to 15°C (60°F) (lowest possible temperature setting) with the dual function disabled (if equipped). Manually set blower on HI. If the vehicle has a fresh air/recirc button, set it to FRESH. If the vehicle has an A/C switch or compressor on switch, set it to A/C ON.
  - If the vehicle is equipped with auxiliary climate control, set the auxiliary controls to full COOL in the PANEL mode at HI blower speed.
4. Open all vehicle windows and leave the hood open for the test. Open the rear hatch and/or rear doors (if equipped).

5. Confirm the compressor clutch is engaged and the engine cooling fan(s) are operating or engaged. Allow the vehicle to idle until the suction (low-side) and discharge (high-side) pressures are stable or fluctuate in a range that repeats.
6. Record the ambient (shop) temperature.
7. Record the discharge pressure. If the pressure is fluctuating, record the average value.
8. Determine if the discharge pressure falls within the normal operating limits using the Normal Refrigerant Discharge Pressures chart.



9. Record the suction pressure. If the pressure is fluctuating, record the average value.
10. Determine if the suction pressure falls between normal operating limits using the Normal Refrigerant Suction Pressures chart.



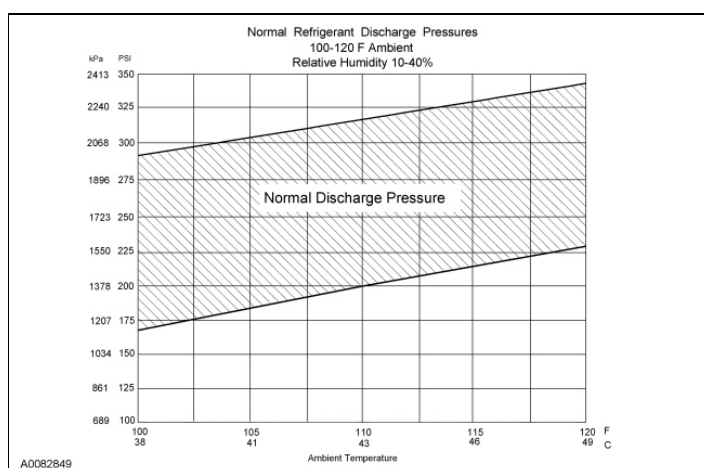
11. Proceed to the Diagnostic Table.

## Procedure 2 - Ambient Temperature Above 38°C (100°F)

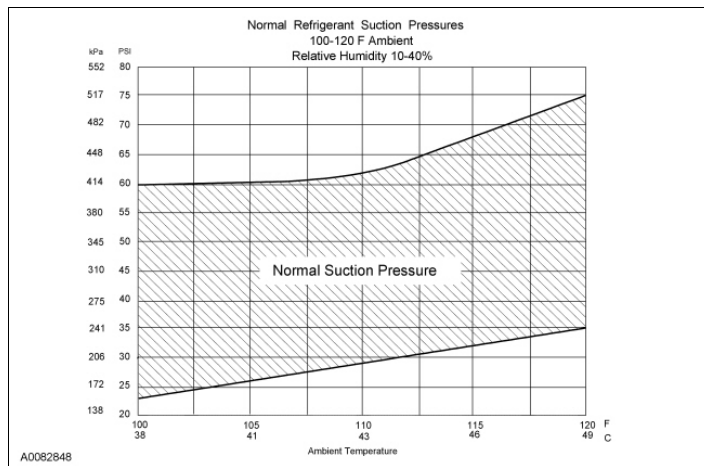
**NOTE:** The system performance can be evaluated and diagnosed by analysis of the compressor suction and discharge pressures. The following procedure is used to determine if the system is operating at normal pressures.

**NOTE:** The procedure varies depending on the ambient (shop) temperature. If the ambient temperature is 38°C (100°F) or lower, follow Procedure 1. If the ambient temperature is over 38°C (100°F), follow Procedure 2.

1. Drive the vehicle or run the engine until it reaches normal operating temperature.
2. Connect a R-134a Manifold Gauge Set or R-134a Refrigerant Management Machine with high-pressure and low-pressure gauges to the refrigerant system.
3. Set the climate controls.
  - If equipped with manual climate control, set the A/C controls for normal A/C-PANEL mode, full COOL temperature, FRESH air, MED-LO blower. If the vehicle has a fresh air/recirc button, set it to FRESH. If the vehicle has an A/C switch or compressor on switch, set it to A/C ON.
  - If equipped with EATC, set temperature to 15°C (60°F) (lowest possible temperature setting). Manually set blower to MED-LO (3 to 4 bars). If the vehicle has a fresh air/recirc button, set it to FRESH. If the vehicle has an A/C switch or compressor on switch, set it to A/C ON.
  - If the vehicle is equipped with auxiliary climate control, set the auxiliary controls to full COOL in the PANEL mode at MED-LO blower speed.
4. Open all vehicle windows and leave the hood open for the test. Open the rear hatch and/or rear doors (if equipped).
5. Confirm the compressor clutch is engaged and the engine cooling fan(s) are operating or engaged. Allow the vehicle to idle until the suction (low-side) and discharge (high-side) pressures are stable or fluctuate in a range that repeats.
6. Record the ambient (shop) temperature.
7. Record the discharge pressure. If the pressure is fluctuating, record the average value.
8. Determine if the discharge pressure falls within the normal operating limits using the Normal Refrigerant Discharge Pressures chart.



9. Record the suction pressure. If the pressure is fluctuating, record the average value.
10. Determine if the suction pressure falls between normal operating limits using the Normal Refrigerant Suction Pressures chart.



11. Proceed to the diagnostic table.

### Diagnostic Table

1. **NOTE:** The following table is used to guide diagnosis of the refrigerant system if operating pressures are outside normal limits.

Refer to the chart below.

High (Discharge) Pressure	Low (Suction) Pressure	Component - Causes
High or Clutch Cycling	High	Condenser - inadequate airflow.
High	Normal to High	Engine - overheating.
Normal to High	Normal	Refrigerant overcharge - air in refrigerant.
Normal to Low	High	Fixed orifice tube - missing O-rings leaking/missing.
Normal to Low	Normal to High	A/C suction line - partially restricted or plugged. <sup>a</sup>
Normal to Low	Low or Clutch Cycling	Low refrigerant charge, A/C suction line - partially restricted or plugged A/C cycling switch - sticking closed (if equipped). <sup>b</sup>
Erratic Operation or Compressor Not Running		A/C cycling switch - poor connection at A/C clutch connector or clutch cycling switch connector. A/C electrical circuit erratic - see A/C Electrical Circuit Wiring Diagram.
Normal to Low	High	Compressor - low performance.
<b>Additional Possible Cause Components Associated With Inadequate Compressor Operation</b>		
<ul style="list-style-type: none"> <li>• Compressor Drive Belt - loose</li> <li>• Compressor Clutch - slipping</li> <li>• Clutch Coil Open - shorted, or loose mounting</li> <li>• Control Assembly Switch - dirty contacts or sticking open</li> <li>• Clutch Wiring Circuit - high resistance, open or blown fuse</li> <li>• Compressor Operation Interrupted by Engine Computer</li> </ul>		
<b>Additional Possible Cause Components Associated With a Damaged Compressor</b>		
<ul style="list-style-type: none"> <li>• Incorrect Clutch Air-gap</li> <li>• Suction Accumulator - refrigerant oil bleed hose plugged</li> </ul>		

- Refrigerant Leaks

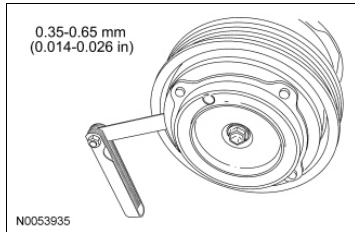
<sup>a</sup> Low pressure reading will be normal to high if pressure is taken at accumulator and if restriction is downstream of service access valve.

<sup>b</sup> Low pressure reading will be low if pressure is taken near the compressor and restriction is upstream of service access valve.

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### **Air Conditioning (A/C) Clutch Air Gap Adjustment**

1. Check the A/C clutch air gap at 3 equally spaced places between the clutch plate and the A/C clutch pulley.




2. Remove the clutch plate. Add or remove spacers between the clutch plate hub and the compressor shaft until the clearance is within specification.
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**Electronic Leak Detection**

## Special Tool(s)

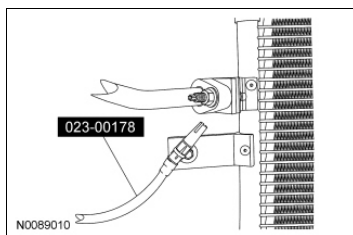
	Heated Pentode Halogen Leak Detector 023-00178 or equivalent
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**NOTE:** Good ventilation is necessary in the area where electronic A/C leak testing is to be carried out. If the surrounding air is contaminated with refrigerant gas, the Heated Pentode Halogen Leak Detector will indicate this gas all the time. Odors from other chemicals such as antifreeze, diesel fuel, disc brake cleaner or other cleaning solvents can cause the same problem. Using a fan to ventilate the area to be tested before proceeding with the leak detection procedure is helpful in removing small traces of contamination from the air, but the fan should be turned off during actual testing.

**NOTE:** R-134a is heavier than air, and will tend to move downward from the source of the leak if present. It is possible that a leak may not be detected if the leak detector tip is held above the leaking fitting, line or component. Always be sure to thoroughly leak test below the fitting, line or component for the presence of R-134a as well as leak testing above and around.

1. **NOTE:** The system pressure should be between 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off and cool. The pressure reading may be higher if the engine is hot.







Leak test the refrigerant system using the Heated Pentode Halogen Leak Detector. Follow the instructions included with the Heated Pentode Halogen Leak Detector for handling and operation techniques.





**Fluorescent Dye Leak Detection**

## Special Tool(s)

 ST3073-A	Cordless/Rechargeable True UV LED Light ES 023-00182 or equivalent
 ST3057-A	R-134a Loop/Add On Injector Kit-Set 219-00069 or equivalent
 ST1928-A	R-134a Manifold Gauge Set 300-R0B40134AE or equivalent
 ST3079A	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 300-R0B34788-PROE or equivalent
 ST3081-A	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 199-00067 or equivalent
 ST3080-A	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 265-00012 or equivalent

## Material

Item	Specification
Stay-Brite® R-134a Leak Detection Dye 164-R6060 (Rotunda)	-

**Fluorescent Dye Injection Using a R-134a Refrigerant Management Machine and Dye Injector - Vehicles Requiring R-134a Addition**

**NOTE:** This method of fluorescent dye injection requires the addition of R-134a from a R-134a Refrigerant Management Machine or R-134a Manifold Gauge Set hooked to an external tank to charge the dye into the refrigerant system. If adding fluorescent dye to a refrigerant system that is already fully charged, the R-134a Loop/Add On Injector Kit-Set method should be used.

**NOTE:** Fluorescent refrigerant system dye is added to the refrigerant system at the factory to assist in refrigerant system leak diagnosis using a Rotunda-approved UV blacklight. It is not necessary to add additional dye to the refrigerant system before diagnosing leaks, even if a significant amount of refrigerant has been removed from the system. Replacement suction accumulators and receiver/driers are shipped with a fluorescent dye "wafer" included in the desiccant bag which will dissolve after approximately 30 minutes of continued A/C operation. It is not necessary to add dye after flushing or filtering the refrigerant system because a new suction accumulator or receiver/drier is installed as part of the flushing or filtering procedure. Additional refrigerant system dye should only be added if more than 50% of the refrigerant system lubricant

capacity has been lost due to a fitting separation, hose rupture or other damage.

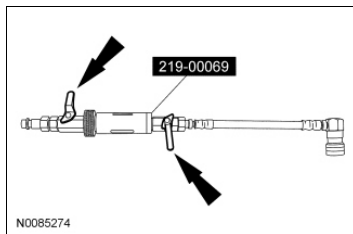
**NOTE:** Before using the R-134a Loop/Add On Injector Kit-Set for the first time, refer to the manufacturer's instructions on evacuation of any non-condensable gases from the hoses.

**NOTE:** Only connect the dye/lubricant injector from the R-134a Loop/Add On Injector Kit-Set when fluorescent dye is to be injected. The dye/lubricant injector has a one-way check valve that will prevent refrigerant system recovery and evacuation.

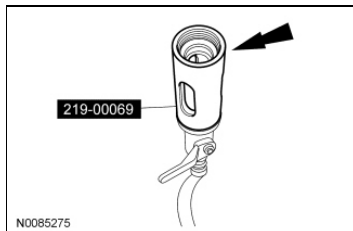
1. **NOTE:** If no R-134a pressure is present in the refrigerant system, the system should be evacuated before carrying out the injection procedure. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

Connect a R-134a Refrigerant Management Machine or a R-134a Manifold Gauge Set to the refrigerant system service port valves.

2. Verify that the valves on the dye/lubricant injector from the R-134a Loop/Add On Injector Kit-Set are closed.



3. Fill the R-134a fluorescent dye injector reservoir with 7 ml (0.25 oz) of fluorescent dye.



4. Install the dye/lubricant injector between the low-pressure service gauge port valve and the R-134a Refrigerant Management Machine or R-134a Manifold Gauge Set.
5. **NOTE:** Following fluorescent dye injection, the refrigerant system should be fully charged to make sure of correct movement of the dye.

Open all valves and inject the fluorescent dye into the refrigerant system by charging the refrigerant system with the required amount of R-134a.

6. When fluorescent dye injection is complete, close all valves.
7. Recover the refrigerant from the dye/lubricant injector.
8. Remove the dye/lubricant injector from the low-pressure service gauge port valve and the R-134a Refrigerant Management Machine or R-134a Manifold Gauge Set.

### Fluorescent Dye Injection Using a R-134a Loop/Add On Injector Kit-Set - Vehicles Not Requiring

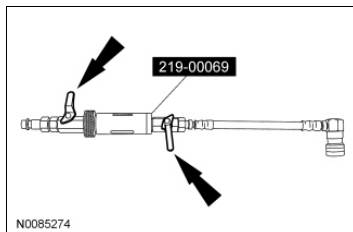
## R-134a Addition

**NOTE:** Fluorescent refrigerant system dye is added to the refrigerant system at the factory to assist in refrigerant system leak diagnosis using a Rotunda-approved UV blacklight. It is not necessary to add additional dye to the refrigerant system before diagnosing leaks, even if a significant amount of refrigerant has been removed from the system. Replacement suction accumulators and receiver/driers are shipped with a fluorescent dye "wafer" included in the desiccant bag which will dissolve after approximately 30 minutes of continued A/C operation. It is not necessary to add dye after flushing or filtering the refrigerant system because a new suction accumulator or receiver/drier is installed as part of the flushing or filtering procedure. Additional refrigerant system dye should only be added if more than 50% of the refrigerant system lubricant capacity has been lost due to a fitting separation, hose rupture or other damage.

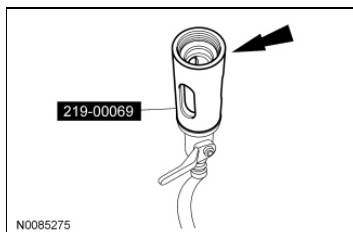
**NOTE:** Before using the R-134a Loop/Add On Injector Kit-Set for the first time, refer to the equipment manufacturer's instructions on evacuation of non-condensable gases from the hoses.

**NOTE:** Refrigerant system pressure should be between 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off and cool.

1. Verify that the valves on the R-134a Loop/Add On Injector Kit-Set are closed.



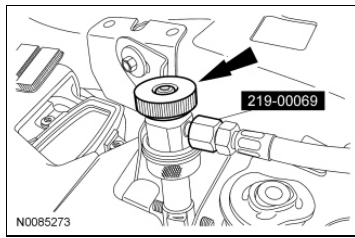
2. Fill the R-134a Loop/Add On Injector Kit-Set reservoir with 7 ml (0.25 oz) of fluorescent dye.



3. Install the R-134a Loop/Add On Injector Kit-Set between the high-pressure and low-pressure service gauge port valves.
4. **NOTICE:** Make sure all tools and hoses are clear of the engine cooling fan and drive belt before starting the engine. Failure to keep tools and hoses clear from the engine cooling fan and drive belt will result in damage to the tools and/or vehicle.

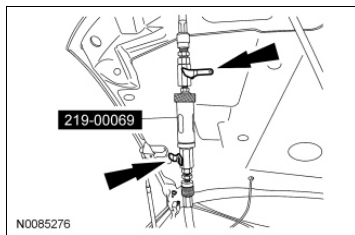
With the A/C off, start the engine. Allow engine speed to stabilize below 1,000 rpm.

5. Set the A/C to the ON position.
6. Open the high-pressure service valve.

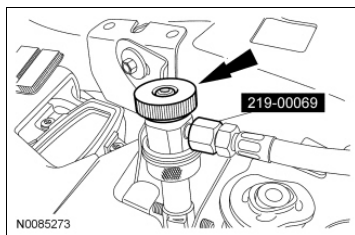


7. **NOTE:** To prevent pressure spike/liquid slug, crack the R-134a Loop/Add On Injector Kit-Set valves and slowly open to inject the fluorescent dye into the refrigerant system.

Open the R-134a Loop/Add On Injector Kit-Set valves and inject the fluorescent dye into the refrigerant system.

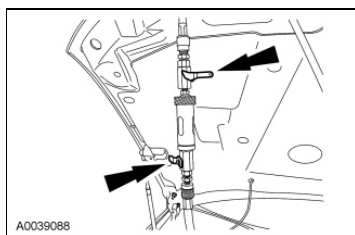


8. Close the high-pressure service valve to allow the pressure inside the R-134a Loop/Add On Injector Kit-Set to equalize with the suction side of the refrigerant system.



9. **NOTE:** Close the valves on the R-134a Loop/Add On Injector Kit-Set while the A/C compressor is operating.

Close the valves on the R-134a Loop/Add On Injector Kit-Set.



10. **NOTE:** Leave all valves on the R-134a Loop/Add On Injector Kit-Set closed when not in use.

Disconnect the high-pressure and low-pressure service valves and remove the R-134a Loop/Add On Injector Kit-Set from the vehicle.

### Fluorescent Dye Detection

**NOTE:** Ford Motor Company vehicles are produced with R-134a fluorescent dye installed in the refrigerant system from the factory. The location of leaks can be pinpointed by the bright yellow-green glow of the

fluorescent dye under a UV lamp. Since more than one leak can exist, make sure to inspect each component, line and fitting in the refrigerant system for a leak.

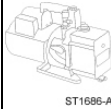

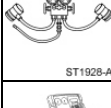



**NOTE:** Use of dye-enhancing glasses or goggles greatly improves the detection of the dye under the UV lamp.

**NOTE:** Not all UV lamps will fluoresce the dye used in Ford vehicles. All Rotunda UV lamps are optimized to fluoresce the dye.

1. Check for leaks using a Rotunda-approved UV lamp and dye enhancing glasses.
    - Inspect all components, lines and fittings of the refrigerant system.
  2. After the leak(s) is repaired, remove any traces of fluorescent dye with a general purpose oil solvent.
  3. Verify the repair by running the vehicle for a short period of time and rechecking the area of the leak with a Rotunda-approved UV lamp.
-

**Air Conditioning (A/C) System Recovery, Evacuation and Charging**

## Special Tool(s)

 ST1686-A	6.0 CFM Vacuum Pump 300-R0B15600E or equivalent
 ST2742-A	Automatic Refrigerant Charging Meter 023-00155 or equivalent
 ST1928-A	R-134a Manifold Gauge Set 300-R0B40134AE or equivalent
 ST3078A	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 300-R0B34788-PROE or equivalent
 ST3081-A	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 199-00067 or equivalent
 ST3080-A	R-134a Refrigerant Management Machine (SAE J-2788 Compliant) 265-00012 or equivalent

## Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

**Refrigerant System Recovery**

**NOTICE:** An Air Conditioning (A/C) refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts the shop's bulk refrigerant at risk of contamination. If the vehicle's A/C refrigerant is contaminated, refer the customer to the service facility that carried out the last A/C service. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturer procedures and instructions.

**NOTE:** Ford Motor Company recommends the use of R-134a refrigerant management equipment that meets the requirements of the SAE J2788 standard.

1. Prior to recovering, the purity of the refrigerant must be verified. For additional information, refer to Refrigerant Identification Testing in this section.



2. Connect a R-134a Refrigerant Management Machine to the low- and high-pressure service gauge port valves following the operating instructions provided by the equipment manufacturer.
3. Recover the refrigerant from the system following the operating instructions provided by the equipment manufacturer. Note the amount of oil removed during the refrigerant recovery (if any). Add that same amount back into the system once repairs are complete.
4. Once the R-134a Refrigerant Management Machine has recovered the refrigerant, switch OFF the power supply.
5. Allow the system to set for about 2 minutes, and observe the system vacuum reading. If the vacuum is not lost, disconnect the recovery equipment.
6. If the system does lose vacuum, repeat Steps 3 through 5 until the vacuum level remains stable for 2 minutes.
7. Carry out the required repairs.

### **Refrigerant System Evacuation Using a R-134a Refrigerant Management Machine**

1. Connect a R-134a Refrigerant Management Machine to the low- and high-pressure service gauge port valves following the operating instructions provided by the equipment manufacturer.
2. Evacuate the system until the low-pressure gauge reads at least 99.4 kPa (29.5 in-Hg) of vacuum and as close to 101.1 kPa (30 in-Hg) as possible. Continue to operate the Vacuum Pump for a minimum of 45 minutes.
3. Turn OFF the Vacuum Pump. Observe the low-pressure gauge for 5 minutes to make sure that the system vacuum is held.

### **Refrigerant System Evacuation Using a R-134a Manifold Gauge Set and Vacuum Pump**

**NOTE:** Leaks in refrigerant system service equipment, hoses or gauges can cause a leak in vacuum that may be misinterpreted as a problem with the vehicle's refrigerant system. It is necessary to leak-test all refrigerant system service equipment, hoses and gauges on a weekly basis to verify that no leaks are present.

1. Connect the R-134a Manifold Gauge Set to the low-side and high-side service gauge port valves.
2. Connect the center (yellow) hose from the R-134a Manifold Gauge Set to the suction port on the Vacuum Pump.
3. Open all valves on the R-134a Manifold Gauge Set and both service gauge port valves.
4. Turn on the Vacuum Pump and evacuate the system until the low-pressure gauge reads at least 99.4 kPa (29.5 in-Hg) of vacuum and as close to 101.1 kPa (30 in-Hg) as possible. Continue to operate the Vacuum Pump for a minimum of 45 minutes.
5. Close the high-side and low-side valves on the R-134a Manifold Gauge Set (not the service gauge port valves) and turn OFF the Vacuum Pump.
6. Observe the low-pressure gauge for 5 minutes to make sure that the system vacuum is held. If vacuum is not held for 5 minutes, leak test the system, repair the leak and evacuate the system again.

### **Refrigerant System Charging Using a R-134a Refrigerant Management Machine**

1. Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Refrigerant Oil Adding in this section.
2. Connect a R-134a Refrigerant Management Machine to the low-side and high-side service gauge port valves following the operating instructions provided by the equipment manufacturer.
3. Set the refrigerant charge amount, and charge the refrigerant system following the instructions provided by the equipment manufacturer.




### **Refrigerant System Charging Using a R-134a Manifold Gauge Set and Automatic Refrigerant Charging Meter**

**NOTE:** Ford Motor Company recommends use of a R-134a Refrigerant Management Machine to carry out charging of the refrigerant system. If a R-134a Refrigerant Management Machine is not available, refrigerant system charging may be accomplished using a separate Automatic Refrigerant Charging Meter and R-134a Manifold Gauge Set.

1. Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Refrigerant Oil Adding in this section.
  2. Assemble the R-134a Manifold Gauge Set, Automatic Refrigerant Charging Meter and R-134a supply tank following the Automatic Refrigerant Charging Meter operating instructions.
  3. Charge the refrigerant system following the Automatic Refrigerant Charging Meter operating instructions.
  4. If the refrigerant flow stops before the refrigerant charge is complete, start the engine, select MAX A/C operation and allow the refrigerant charge to complete.
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**Air Conditioning (A/C) System Flushing**

## Special Tool(s)

 ST2385-A	A/C Flush Adapter Kit 219-00074 or equivalent
 ST2459-A	A/C Flush and Purge Fitting Kit 219-00024 (part of 219-00023) or equivalent
 ST2456-A	A/C Flush and Purge Machine 219-00022 (part of 219-00023) or equivalent

## Material

Item	Specification
Motorcraft® A/C System Flushing Solvent YN-23	-
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

**NOTICE:** An Air Conditioning (A/C) refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts the shop's bulk refrigerant at risk of contamination. If the vehicle's A/C refrigerant is contaminated, refer the customer to the service facility that carried out the last A/C service. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturer procedures and instructions.

**NOTICE:** Suction accumulator or receiver/drier, Thermostatic Expansion Valve (TXV) and/or evaporator core orifice, and hoses with mufflers, should be removed when flushing the Air Conditioning (A/C) system. Internal plumbing of these devices makes it impossible to correctly remove any residual-flushing agent. These components are typically discarded after A/C system contamination. Hoses without mufflers can normally be reused unless they are clogged with foreign material.

**NOTICE:** Only the listed A/C Flush and Purge Machine, A/C Flush and Purge Fitting Kit, A/C Flush Adapter Kit and A/C System Flushing Solvent are approved for use on Ford vehicles. No other flushing device or solvent is approved for flushing heat exchangers (Air Conditioning [A/C] condenser, A/C evaporator). Use of any other flusher or solvent may cause damage to the A/C system and the flushing unit.

1. Recover the refrigerant. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.

2. Disconnect the refrigerant lines from the heat exchanger(s) to be flushed.
3. Using the correct adapters from the A/C Flush Adapter Kit or A/C Flush and Purge Fitting Kit, connect the A/C Flush and Purge Machine to the heat exchanger to be flushed. Do not flush through the evaporator core orifice (if equipped), Thermostatic Expansion Valve (TXV) (if equipped) or hoses with mufflers. Internal plumbing and material make-up of these components make it impossible to correctly remove foreign material or residual flushing solvent.
4. **NOTE:** Use 3.785L (1 gal) of A/C System Flushing Solvent to flush the heat exchanger for a minimum of 15 minutes. The flush solvent may be used for one or both heat exchangers in the A/C system. However, the flush solvent is intended for one vehicle only. The filter used on the flushing unit is also intended for use on one vehicle only.


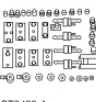
Flush the heat exchanger for a minimum of 15 minutes.

5. Apply 621-862 kPa (90-125 psi) pressurized air to the component for a minimum of 30 minutes. The 30-minute purge time is required to force and evaporate all residual solvent from the A/C system component. Failure to successfully remove all residual solvent within the component can result in system damage when reconnected and operated. Dispose of the used flush solvent and filter in accordance with local, state and federal regulations.
  6. **NOTE:** A/C system filtering as described in this section is optional if system flushing is carried out. However, the filter kit use is recommended after flushing if the A/C system contamination is extensive.  
  
Install a new A/C evaporator core orifice (if equipped) and/or TXV (if equipped) in any vehicle being serviced for an internal A/C compressor or desiccant failure.
  7. Install new refrigerant hoses with mufflers if clogged with foreign material.
  8. Install a new suction accumulator (if equipped), receiver/drier (if equipped) or receiver/drier cartridge (if equipped) in any vehicle being serviced for an internal A/C compressor or desiccant failure.
  9. Reconnect the heat exchanger being serviced.
  10. If a new A/C compressor is not to be installed, lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Refrigerant Oil Adding in this section.
  11. If a new A/C compressor is not to be installed, evacuate, leak test and charge the A/C system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
  12. If a new A/C compressor is to be installed, refer to the A/C Compressor removal and installation procedure.
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**Refrigerant System Filtering Following Air Conditioning (A/C) Compressor Installation**

## Special Tool(s)

 ST2385-A	A/C Flush Adapter Kit 219-00074 or equivalent
 ST2459-A	A/C Flush and Purge Fitting Kit 219-00024 or equivalent

## Material

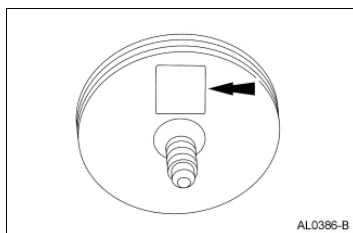
Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

**NOTICE:** An Air Conditioning (A/C) refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts the shop's bulk refrigerant at risk of contamination. If the vehicle's A/C refrigerant is contaminated, refer the customer to the service facility that carried out the last A/C service. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturer's procedures and instructions.

**NOTICE:** On vehicles being serviced for an internal compressor or desiccant failure, a new suction accumulator or receiver/drier, Thermostatic Expansion Valve (TXV) or evaporator core orifice and any hoses containing mufflers must be installed prior to filtering the Air Conditioning (A/C) system. Internal plumbing of these devices makes it impossible to correctly remove any foreign material. These components are typically discarded after A/C system contamination. Hoses without mufflers can normally be reused unless they are clogged with foreign material. The filter is intended for use on one vehicle only.

1. **NOTE:** The filter inlet is marked with a label on one side of the filter body.

Orient the filter inlet toward the A/C condenser core.



2. **NOTICE:** The flexible extension adapters included in the A/C Flush Adapter Kit are designed for low-pressure flushing and are not designed for use with a charged refrigerant system. Do

**not make the condenser fitting connections using the flexible extension adapters or damage to the adapters and loss of refrigerant will occur.**

**NOTE:** The F8VZ-19E773-AB pancake filter is not permanently installed and will be removed at the end of this procedure.

Disconnect the condenser outlet fitting and temporarily install the pancake filter between the 2 halves of the fitting.


- Use flexible R-134a service hoses of 17,238 kPa (2,500 psi) burst rating.
  - Make the connections using the correct adapters from the A/C Flush Adapter Kit and/or A/C Flush and Purge Fitting Kit.
3. Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Refrigerant Oil Adding in this section.
  4. Evacuate and charge the refrigerant system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
  5. Check all refrigerant system hoses, lines and the position of the newly installed filters to be sure they do not interfere with other engine compartment components. If necessary, use tie straps to make adjustments.
  6. Provide adequate airflow to the front of the vehicle (with a fan, if necessary). Select A/C operation and set the blower motor speed to maximum. Start the engine and let it idle briefly. Make sure the A/C system is operating correctly.
  7. Using a scan tool, command the idle to gradually bring the engine up to 1,200 rpm by running it at lower rpms for short periods (first at 800 rpm, then at 1,000 rpm). Set the engine at 1,200 rpm and run it for one hour with the A/C system operating.
  8. Stop the engine.
  9. Recover the refrigerant. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
  10. Remove the adapters, flexible hoses and pancake filter from between the condenser and the condenser to evaporator tube.
  11. Discard the pancake filter. It can be used one time only.
  12. Reconnect the condenser outlet fitting.
  13. Evacuate, charge and leak-test the refrigerant system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
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**Refrigerant Oil Adding**

Special Tool(s)

	R-134a Loop/Add On Injector Kit-Set 219-00069 or equivalent
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Material

Item	Specification
Motorcraft® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

**Refrigerant Oil Adding**

**NOTE:** During normal A/C operation, oil is circulated through the system with the refrigerant, and a small amount is retained in each component. If certain components of the system are removed, some of the PAG oil will go with the component. To maintain the original total oil charge, it is necessary to compensate for the oil lost by adding oil to the system with the new part.

1. Refer to the chart below for refrigerant oil adding amounts and methods of installation.

Component	PAG Oil Amount	Method of Adding
A/C Compressor	Refer to Adding Refrigerant Oil After A/C Compressor Replacement	Add or remove directly through A/C compressor low-side port before installation.
Suction Accumulator or Receiver/Drier	Refer to Adding Refrigerant Oil After New Suction Accumulator or Receiver/Drier Replacement	Add directly to suction accumulator inlet port or inject to low-side service port during system charging.
Evaporator Core	45 ml (1.5 fl oz) added to the amount collected during refrigerant recovery	Add directly to evaporator core inlet tube or inject to low-side service port during system charging.
Condenser Core	60 ml (2 fl oz) added to the amount collected during refrigerant recovery	Add directly to condenser core inlet or inject to low-side service port during system charging.
Evaporator Core Orifice or Thermostatic Expansion Valve (TXV)	The amount collected during refrigerant recovery	Inject to low-side service port during system charging.
A/C Pressure Relief Valve	60 ml (2 fl oz) added to the amount collected during refrigerant recovery	Inject to low-side service port during system charging.

Refrigerant Hose/Line	60 ml (2 fl oz) added to the amount collected during refrigerant recovery <sup>a</sup>	Inject to low-side service port during system charging.
O-ring Leak Repair	60 ml (2 fl oz) added to the amount collected during refrigerant recovery <sup>b</sup>	Inject to low-side service port during system charging.
Service Port Leak Repair	60 ml (2 fl oz) added to the amount collected during refrigerant recovery	Inject to low-side service port during system charging.

<sup>a</sup> If an excessive amount of PAG oil is lost due to a hose rupture/separation or other damage, the total system PAG oil capacity must be added.

<sup>b</sup> The amount specified may be used for one or multiple O-ring leak repairs. Do not multiply the PAG oil amount by the number of O-ring leaks being repaired.

### Adding Refrigerant Oil After A/C Compressor Replacement

#### Service A/C compressors shipped without clutch and pulley

1. Rotate the old A/C compressor shaft 6 to 8 revolutions while collecting oil in a clean measuring device.
  - If the amount of oil drained from the old A/C compressor is between 85-142 ml (3-5 oz), pour the same amount plus 30 ml (1 oz) of clean PAG Refrigerant Compressor Oil (R-134a Systems) (YN-12-D) WSH M1C231-B or equivalent into the new A/C compressor.
  - If the amount of oil that was removed from the old A/C compressor is greater than 142 ml (5 oz), pour the same amount drained of clean PAG Refrigerant Compressor Oil (R-134a Systems) or equivalent into the new A/C compressor.
  - If the amount of oil that was removed from the old A/C compressor is less than 85 ml (3 oz), pour 85 ml (3 oz) of clean A/C Refrigerant Compressor Oil (R-134a Systems) or equivalent into the new A/C compressor.

#### Service A/C compressors shipped with clutch and pulley

2. Rotate the old A/C compressor shaft 6 to 8 revolutions while collecting oil in a clean measuring device.
  - If the amount of oil drained from the old A/C compressor is less than 89 ml (3 oz), remove 118 ml (4 oz) from the new A/C compressor.
  - If the amount of oil drained from the old A/C compressor is 89 ml (3 oz), remove 89 ml (3 oz) from the new A/C compressor.
  - If the amount of oil drained from the old A/C compressor is 118 ml (4 oz), remove 59 ml (2 oz) from the new A/C compressor.
  - If the amount of oil drained from the old A/C compressor is 148 ml (5 oz), remove 29 ml (1 oz) from the new A/C compressor.
  - If the amount of oil drained from the old A/C compressor is greater than 148 ml (5 oz), remove 0 ml (0 oz) from the new A/C compressor.

### Adding Refrigerant Oil After New Suction Accumulator or Receiver/Drier Replacement

**NOTE:** This refrigerant oil adding method is to be used when a new suction accumulator or receiver drier only has been installed. If a new A/C compressor and evaporator core orifice or Thermostatic Expansion Valve (TXV) have also been installed due to system contamination, refer to the appropriate heading.

1. Drill one 12.7 mm (1/2 in) hole in the old suction accumulator or receiver/drier cylinder and drain the oil into a clean measuring cup.
2. Add the same quantity of new PAG oil, plus the amount collected during refrigerant recovery and 60 ml (2 fl oz).

### **Adding Refrigerant Oil After Multiple Component Replacement After A/C System Contamination**

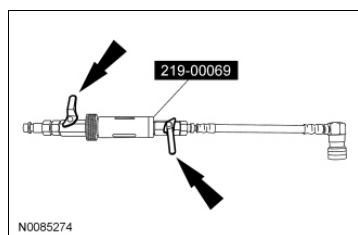
**NOTE:** This refrigerant oil adding method is to be used when a new A/C compressor, suction accumulator or receiver drier and evaporator core orifice or TXV have been installed due to system contamination and the A/C system has been flushed.

1. If the new A/C compressor is shipped with a new clutch and pulley already installed, remove the shipping caps and rotate the new A/C compressor shaft 6 to 8 revolutions while collecting the oil in a clean measuring cup.
2. Add 60 ml (2 fl oz) directly to the new A/C compressor suction port.
3. Inject the total vehicle PAG oil capacity minus 60 ml (2 fl oz) to the low-side service port during system charging. For the total PAG oil capacity specification, refer to the Specifications table in this section.

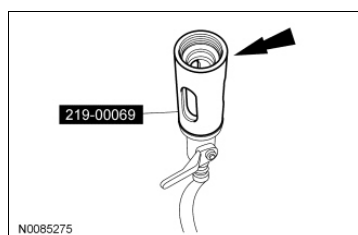
### **Oil Injection Using a Dye/Lubricant Injector**

**NOTE:** If fluorescent leak detection dye is also to be added during A/C charging, the dye may be added to the dye/lubricant injector, from the R-134a Loop/Add On Injector Kit-Set, along with the PAG oil.

1. Evacuate the refrigerant system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
2. Assemble the dye/lubricant injector and the correct adapters from the R-134a Loop/Add On Injector Kit-Set to match the amount of refrigerant compressor oil to be injected.
3. Verify that all the valves on the dye/lubricant injector are closed.




4. Fill the dye/lubricant injector with the correct amount of clean, new PAG oil.



5. Install the dye/lubricant injector between the low-side service gauge port valve and the refrigerant service station or manifold gauge set.
  6. Open all valves and charge the refrigerant system. For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging in this section.
-

## Refrigerant Identification Testing

Special Tool(s)

	Refrigerant Blend Identifier with Printer 198-00012 or equivalent
---	--

### Refrigerant Identification

1. **NOTE:** A Refrigerant Blend Identifier with Printer must be used to identify gas samples taken directly from the refrigeration system or storage containers prior to recovering or charging the refrigerant system.

Follow the instructions included with the Refrigerant Blend Identifier with Printer to obtain the sample for testing.

2. The Refrigerant Blend Identifier with Printer will display one of the following:
  - If the purity level of R-134a is 98% or greater by weight, the green PASS LED will light. The weight concentrations of R-134a, R-12, R-22, hydrocarbons and air will be displayed on the digital display.
  - If refrigerant R-134a does not meet the 98% purity level, the red FAIL LED will light and an alarm will sound alerting the user of potential hazards. The weight concentrations of R-134a, R-12, R-22 and hydrocarbons will be displayed on the digital display.
  - If hydrocarbon concentrations are 2% or greater by weight, the red FAIL LED will light, "Hydrocarbon High" will be displayed on the digital display, and an alarm will sound alerting the user of potential hazards. The weight concentrations of R-134a, R-12, R-22 and hydrocarbons will also be displayed on the digital display.
3. The percentage of air contained in the sample will be displayed if the R-134a content is 98% or greater. The Refrigerant Blend Identifier with Printer eliminates the effect of air when determining the refrigerant sample content because air is not considered a contaminant, although air can affect A/C system performance. When the Refrigerant Blend Identifier with Printer has determined that a refrigerant source is pure (R-134a is 98% or greater by weight) and air concentration levels are 2% or greater by weight, it will prompt the user if an air purge is desired.
4. If contaminated refrigerant is detected, repeat the refrigerant identification test to verify that the refrigerant is indeed contaminated.

### Contaminated Refrigerant Handling

**NOTICE:** If contaminated refrigerant is detected, DO NOT recover the refrigerant into R-134a recovery/recycling equipment. Recovery of contaminated refrigerant will contaminate the recovered refrigerant supply and may damage the recovery/recycling equipment.

**NOTE:** A new suction accumulator or receiver/drier must be installed as directed by the A/C system flushing procedure.


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1. Recover the contaminated refrigerant using suitable recovery-only equipment designed for capturing and storing contaminated refrigerant only.
    - If this equipment is not available, contact an A/C service facility in the area with the correct equipment to carry out this service.
  2. Determine and correct the cause of the customer's initial concern.
  3. Flush the A/C system.
  4. Dispose of the contaminated refrigerant in accordance with all federal, state and local regulations.
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**Vacuum Hose Repair - Mini-Tube**

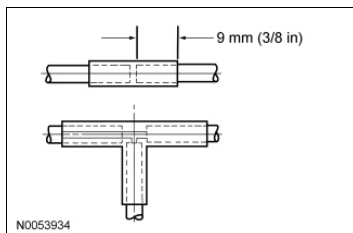
## Special Tool(s)

 ST1176-A	Vacuum Pump Kit 416-D002 (D95L-7559-A) or equivalent
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1. Measure the length of the damaged area of the mini-tube vacuum hose.
2. Cut a piece of standard 1/8-inch inner diameter vacuum hose approximately 25 mm (1 in) longer than the damaged area of the mini-tube vacuum hose.
3. Cut off the mini-tube vacuum hose on each side of the damaged area.
4. **⚠ WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in serious personal injury.**

Dip the mini-tube hose ends in commercially available paint thinner containing Methyl Ethyl Ketone (MEK). This solvent will seal the mini-tube in the vacuum hose.

5. Insert the ends of the mini-tube vacuum hose approximately 9 mm (3/8 in) into the ends of the standard 1/8-inch repair vacuum hose section.




6. Shake the repair joint after assembly to make sure the solvent is dispersed and the vacuum line is not plugged.
  7. Test the system for a vacuum leak in the repair area.
    - Use the Vacuum Pump Kit or equivalent.
-





**Air Conditioning (A/C) Odor Treatment**

## Special Tool(s)

 A flexible applicator tool with a spray nozzle and a long, flexible hose. The part number ST2940-A is visible in the bottom left corner of the image.	Flexible Applicator Tool 258-00005
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## Material

Item	Specification
Motorcraft® A/C Cooling Coil Coating YN-29	-

**⚠ WARNING:** Carry out this procedure in a well-ventilated area with all vehicle windows and doors opened. Carefully read cautionary information on product label. For **EMERGENCY MEDICAL INFORMATION**, seek medical advice. On Ford/Motorcraft products in the USA or Canada call: **1-800-959-3673**. For additional information, consult the product Material Safety Data Sheet (MSDS), if available. Failure to follow these instructions may result in serious personal injury.

**NOTE:** There are typically 4 types of objectionable odors found in a vehicle:

- Chemical odors
- Environmental odors
- Human and other interior-generated odors
- Microbiological odors

Before determining that A/C odor treatment is required, the source and the circumstances under which the odor occurs must be determined.

**NOTE:** Chemical odors are usually constant regardless of the climate control system setting although they may be enhanced by A/C operation. Most chemical odors are caused by fluid leaks or incorrectly cured adhesives. Chemical odors can be eliminated by repairing the leaking component and removing any residue.

**NOTE:** Environmental odors usually occur for a short time and diminish after the vehicle passes through the affected area. These odors are typically only detected when the vehicle windows are open, or when the climate control system is operating in a mode that allows for fresh air. Environmental odors cannot be eliminated because they are external in source, but they may be minimized by switching to a climate control setting that uses recirculated air.

**NOTE:** Human and other interior-generated odors occur while the source is present and may linger for a short time after. These odors may be more noticeable during A/C operation. Human odors may be eliminated by removing the source and cleaning the affected area.

**NOTE:** Microbiological odors, if in the A/C system, usually last for about 30 seconds after the system is turned on. They will be detected while the A/C is turned on and using either outside or recirculated air. Microbiological odors that occur in areas other than the A/C system (for example, water in doors or wet carpeting) may last indefinitely and will be more intense when recirculated air is used. Microbiological odors

will not be present at temperatures at or below 10°C (50°F).

Microbiological odors can be eliminated by removing the source and treating the affected area. Standing water must be allowed to drain and dry out. A/C systems may be treated by using A/C cooling coil coating as described in the service procedure below.

Microbiological odors result from microbial growth supported by warm temperatures and moisture. Microbiological odors are described as musty/mildew type smells and may occur on/in:

- foam seals.
- rubber seals.
- adhesives.
- standing water.
- water soaked carpet/trim.

1. Identify the type of odor present in the vehicle. Do not proceed with A/C odor treatment if the odor source is found to be outside of the A/C system. Refer to the following chart for examples.

Odor Source	Odor Description
<b>Chemical Odors</b>	
Coolant	Sweet smell
Fuel	Gasoline or diesel fuel smell
Oil	Oil type or burning smell
Power Steering Fluid	Oil type or burning smell
Transmission Fluid	Oil type or burning smell
Washer Fluid	Alcohol type smell
Gear Lube	Garlic/sulfur smell
Refrigerant Oil	Ether type smell
Carpet/trim Adhesives	Fishy, urine or sweet smell
Evaporator Core Coating	Wet cement type smell
<b>Environmental Odors</b>	
Exhaust	Exhaust, fuel or burning type smell
Industrial Pollutants	Various smells
Dust	Musty, mildew or wet cement type smell
Pollen	Sweet smell
Tobacco	Burning, tar smell
<b>Human and Other Interior Generated Odors</b>	
Body Secretions	Body odor
Perfuming Agents	Sweet or fragrance smell
Clothing	Musty, mildew or body odors
Food/Beverage	Sweet, musty, mildew or fishy smell
<b>Microbiological Odors</b>	
Microbiological Odors Occurring Inside of A/C System	Musty, mildew smell lasting about 30 seconds after A/C is turned on
Microbiological Odors Occurring Outside of A/C System	Musty, mildew smell lasting indefinitely and possibly more pronounced when using recirculated air

2. Identify the source of the odor.
    - Check the evaporator core drain tube for restriction.
    - Check the passenger and driver side carpet for moisture. If moisture is found, A/C odor treatment is not necessary. Diagnose for a water leak as needed.
    - Check the blower motor and blower motor cover (if equipped) for moisture resulting from water bypassing the cowl baffling system. If moisture is found, A/C odor treatment is not necessary. Diagnose for a water leak as needed.
    - Check the cowl top panel and air inlet screen for standing water or foreign material. If possible, remove any standing water and clean the air inlet screen using a wet/dry vacuum.
  3. Open all vehicle windows and doors.
  4. Make sure that the A/C is off.
  5. Set the following.
    - Select PANEL mode (A/C off).
    - Adjust the temperature setting to full warm.
    - Adjust the blower motor speed to HI.
  6. Run the engine for 25 minutes to dry out the A/C system.
  7. Turn the ignition OFF.
  8. Remove the blower motor.
  9. **NOTE:** Blower motor speed controls that are mounted outside of the evaporator core housing and not exposed to the blower motor airflow do not need to be removed.

Remove the blower motor resistor (if equipped) or blower motor speed control (if equipped and exposed to the inside of the evaporator core housing).
  10. **NOTICE:** To avoid damage to the vehicle interior, do not spill or spray this product on any interior surface.

Add one full bottle of A/C cooling coil coating to the Flexible Applicator Tool.
  11. Insert the nozzle into the evaporator housing and direct the spray toward the evaporator core face. Spray the entire evaporator core face until empty.
  12. Install the blower motor and blower motor resistor (if equipped) or blower motor speed control (if equipped).
  13. Repeat Steps 4 through 6 to cure the evaporator core coating.
-



## Material

Item	Specification	Fill Capacity
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	-
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B	207 ml (7 fl oz)
R-134a Refrigerant YN-19 (US); CYN-16-P or CYN-16-R (Canada)	WSH-M17B19-A	0.77 kg (27 oz) 1.7 lb)

## General Specifications

Item	Specification
<b>A/C Evaporator Core Orifice</b>	
Color	Orange
Diameter	1.45 mm (0.057 in)
<b>Magnetic Clutch</b>	
Air gap clearance	0.35-0.65 mm (0.014-0.026 in)

## Torque Specifications

Description	Nm	lb-ft	lb-in
A/C clutch disc and hub bolt	13	-	115
A/C compressor stud bolts	25	18	-
A/C fitting nut	15	-	133
A/C pressure relief valve	10	-	89
Cooling module bracket bolts	10	-	89
High-pressure Schrader-type valve	2.5	-	22
High-pressure service gauge port valve cap	0.8	-	7
Low-pressure Schrader-type valve	1.8	-	16
Low-pressure service gauge port valve cap	0.8	-	7
Suction accumulator bolts	15	-	133



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## Air Conditioning

The A/C refrigerant system is a clutch cycling orifice tube type. The system components include:

- A/C compressor
- Clutch and clutch field coil
- A/C condenser core
- A/C evaporator core
- Suction accumulator
- Connecting refrigerant lines

The refrigeration system operation is controlled by:

- Evaporator core orifice
- A/C cycling switch
- A/C pressure sensor
- A/C compressor pressure relief valve

The refrigerant system incorporates an A/C compressor controlled by an A/C cycling switch.

The A/C cycling switch senses the A/C suction pressure to control A/C compressor operation.

An A/C compressor pressure relief valve is installed in the rear of the A/C compressor to protect the refrigerant system against excessively high refrigerant pressures.

The A/C evaporator core orifice is installed in the condenser-to-evaporator tube to meter the liquid refrigerant into the A/C evaporator core.

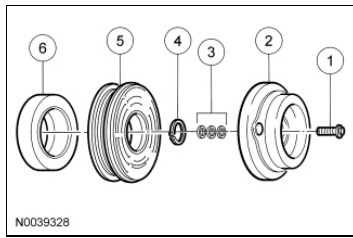
### A/C Compressor and Clutch Assembly

**NOTE:** Internal FS18 A/C compressor components are not serviced separately. The A/C compressor is serviced only as an assembly. The clutch disc and hub, A/C compressor pulley and bearing, and clutch field coil are serviceable.

**NOTE:** Installation of a new suction accumulator is not required when repairing the A/C system, except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator.

The FS18 A/C compressor has the following characteristics:

- A non-serviceable shaft seal
- A pressure relief valve is installed in the rear of the compressor to protect the refrigerant system against excessively high refrigerant pressures
- The A/C compressor uses PAG oil or equivalent. This oil contains special additives required for the A/C compressor
- The A/C compressor oil from vehicles equipped with an FS18 A/C compressor may have some slightly dark-colored streaks while maintaining normal oil viscosity. This is normal for this A/C compressor because of break-in wear that can discolor the oil
- Use standard oil matching procedures when installing new compressors



Item	Part Number	Description
1	-	A/C clutch bolt
2	19D786	A/C clutch disc and hub
3	19D648	A/C clutch disc and hub spacer
4	-	A/C compressor pulley snap ring
5	19D784	A/C compressor pulley
6	19D798	A/C clutch field coil

When battery voltage is applied to the A/C compressor clutch field coil, the clutch plate and hub assembly is drawn toward the A/C clutch pulley. The magnetic force locks the clutch plate and hub assembly and the A/C clutch pulley together as one unit, causing the compressor shaft to rotate. When battery voltage is removed from the A/C compressor clutch field coil, springs in the clutch plate and hub assembly move the clutch plate away from the A/C clutch pulley.

### A/C Compressor Pressure Relief Valve

**NOTE:** If the A/C compressor is operating within limits and the A/C pressure relief valve is venting, or if the A/C pressure relief valve is leaking around the threads, replace the A/C pressure relief valve and O-ring. If the A/C pressure relief valve still vents after it is replaced, diagnose the refrigerant system for a restriction.

An A/C pressure relief valve is incorporated in the A/C compressor to prevent damage to the A/C compressor and other system components by relieving unusually high system discharge pressure buildups. For specifications regarding operating pressure(s), refer to [Section 412-00](#).

The A/C pressure relief valve is a separate component and can be replaced separately from the A/C compressor. It is necessary to recover the refrigerant before removing the A/C pressure relief valve.

### A/C Condenser/Transmission Combo Cooler

The A/C condenser/transmission combo cooler has the following characteristics:

- It is an aluminum fin-and-tube design heat exchanger located in front of the vehicle radiator.
- It cools compressed refrigerant gas by allowing air to pass over fins and tubes to extract heat and by condensing gas to liquid refrigerant as it is cooled.
- The bottom portion of the cooler is separated to be used for transmission oil cooling.

### A/C Evaporator Core

**NOTE:** The evaporator core is not separately serviceable. It is serviced only with the evaporator core housing assembly.

The A/C evaporator core is the plate/fin type.



- A mixture of refrigerant and oil enters the bottom of the A/C evaporator core through the A/C evaporator core inlet tube and moves out of the A/C evaporator core through the A/C evaporator core outlet tube.
- Air from the blower motor is cooled and dehumidified as it flows through the evaporator core fins.

### A/C Evaporator Core Orifice

**NOTE:** A new A/C evaporator core orifice should be installed whenever a new A/C compressor is installed.

The A/C evaporator core orifice has the following characteristics:

- It is located in the evaporator core inlet tube
- It has filter screens located on the inlet and outlet ends of the tube body
- The inlet filter screen acts as a strainer for the liquid refrigerant flowing through the A/C evaporator core orifice
- O-ring seals on the A/C evaporator core orifice prevent the high-pressure liquid refrigerant from bypassing the A/C evaporator core orifice
- The A/C evaporator core orifice assembly cannot be adjusted or serviced. It must be installed as a unit

### Suction Accumulator

**NOTE:** Installation of a new suction accumulator is not required when repairing the A/C system, except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator. Damage to the suction accumulator includes leaks in the suction accumulator, physical damage to the suction accumulator shell or desiccant, or moisture contamination. Moisture contamination results only from a complete loss of refrigerant and equalization of the refrigerant system pressure with atmospheric pressure for a period longer than one hour. If even a slight amount of positive refrigerant pressure is present in the system before repairs are carried out, the suction accumulator should not be replaced.

The suction accumulator is mounted to the RH frame rail, below the coolant degas bottle.

After entering the inlet of the suction accumulator, heavier oil-laden refrigerant contacts an internally mounted dome (which serves as an umbrella) and drips down onto the bottom of the canister.

- A small diameter oil bleed hole, in the bottom of the vapor return tube, allows the accumulated heavier liquid refrigerant and oil mixture to re-enter the compressor suction line at a controlled rate.
- As the heavier mixture passes through the small diameter liquid bleed hole, it has a second chance to vaporize and recirculate through the A/C compressor without causing compressor damage due to slugging.
- A fine mesh screened filter fits tightly around the bottom of the vapor return tube to filter out refrigerant system contaminant particles.
- A desiccant bag is mounted inside the canister to absorb any moisture which may be in the refrigerant system.

### A/C Pressure Sensor

The PCM monitors the refrigerant system high-side pressure through the A/C pressure sensor.

- A valve depressor, located inside the threaded end of the A/C pressure sensor, presses a Schrader valve stem on the compressor discharge line portion of the compressor-to-condenser discharge line.
- The A/C pressure sensor provides a voltage that is proportional to the A/C compressor discharge

pressure, which allows for the A/C compressor discharge pressure to be monitored by the PCM.

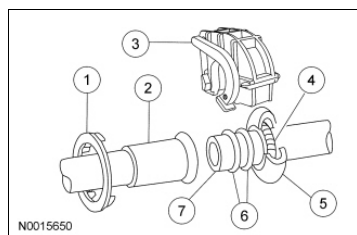
- The PCM uses this information for A/C clutch control, cooling fan control and idle speed.
- It is not necessary to recover the refrigerant to remove the A/C pressure sensor.

## A/C Cycling Switch

The A/C cycling switch is mounted on a Schrader valve-type fitting on the top of the suction accumulator.

- The electrical switch contacts open when the suction pressure drops below normal levels. The contacts close when the suction pressure rises. For specifications regarding operating pressure(s), refer to [Section 412-00](#).
- When the A/C cycling switch contacts open, the A/C clutch field coil is de-energized and compressor operation stops.
- A valve depressor, located inside the threaded end of the A/C cycling switch, presses in on the Schrader valve stem, allowing the suction pressure inside the suction accumulator to control the operation of the A/C cycling switch.
- It is not necessary to discharge the refrigerant system to remove the A/C cycling switch.

## Spring Lock Coupling



Item	Part Number	Description
1	-	Plastic indicator ring
2	-	Female fitting
3	19E746	A/C tube lock coupling clip
4	19E576	A/C tube lock coupling spring
5	-	Cage
6	19E889	O-ring seals
7	-	Male fitting

The spring lock coupling is a refrigerant line coupling held together by a garter spring inside a circular cage.

- When the coupling is connected together, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting.
- The garter spring and cage then prevent the flared end of the female fitting from pulling out of the cage.
- The O-ring seals are green in color and are made of a special material.
- Use only the specified green O-ring seals listed in the Master Parts Catalog for the spring lock coupling.
- A plastic indicator ring is used on the spring lock couplings of the A/C evaporator core to indicate, during vehicle assembly, that the coupling is connected. Once the coupling is connected, the indicator ring is no longer necessary, but remains captive by the coupling near the cage opening.

## A/C Line (Peanut) Fitting

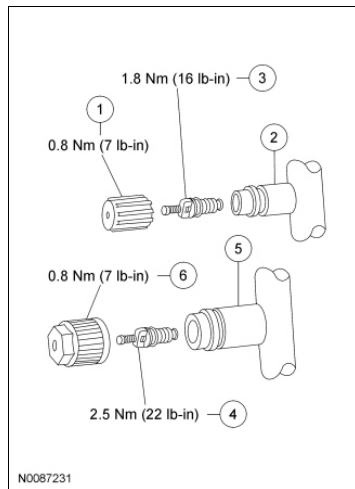
The A/C line (peanut) fitting is an integral part of the refrigeration line or component.

- The male and female blocks of the A/C line (peanut) fitting are retained with a nut.
- An O-ring seal and a gasket are installed around the tube on the male block.
- The female and male blocks are welded to the tubes and are not adjustable.
- When correctly assembled, the male and female fittings should be flush with the gasket.

### Service Gauge Port Valves

The high-pressure service gauge port valve is located on the compressor-to-condenser discharge line.

The low-pressure service gauge port valve is located on the suction accumulator.



Item	Part Number	Description
1	19D702	A/C charging valve cap
2	-	Low-pressure service gauge port valve
3	19D701	Low-pressure Schrader-type valve
4	19D701	High-pressure Schrader-type valve
5	-	High-pressure service gauge port valve
6	19D702	A/C charging valve cap

The fitting is an integral part of the refrigeration line or component.

- Special couplings are required for both the high-side and low-side service gauge ports.
- A very small amount of leakage will always be detectable around the Schrader-type valve with the service gauge port valve cap removed, and is considered normal. A new Schrader-type valve core can be installed if the seal leaks excessively.
- The service gauge port valve caps are used as primary seals in the refrigerant system to prevent leakage through the Schrader-type valves from reaching the atmosphere. Always install and tighten the A/C service gauge port valve caps to the correct torque after they are removed.

### Refrigerant System Dye

Fluorescent refrigerant system dye is added to the refrigerant system at the factory to assist in refrigerant system leak diagnosis using a Rotunda-approved ultraviolet blacklight. It is not necessary to add additional dye to the refrigerant system before diagnosing leaks, even if a significant amount of refrigerant has been removed from the system. New suction accumulators are shipped with a fluorescent dye "wafer" included in

the desiccant bag which will dissolve after approximately 30 minutes of continued A/C operation. It is not necessary to add dye after flushing or filtering the refrigerant system because a new suction accumulator is installed as part of the flushing or filtering procedure. Additional refrigerant system dye should only be added if more than 50% of the refrigerant system lubricant capacity has been lost due to a fitting separation, hose rupture or other damage. Refer to Section 412-00 .

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## Air Distribution and Filtering

**NOTE:** The air distribution system of this vehicle cannot be equipped with a cabin air filter.

There are 2 sources of air available to the air distribution system:

- Outside air
- Recirculated air

Recirculated air is only used during MAX A/C, AUTOMATIC and OFF modes if equipped with Electronic Automatic Temperature Control (EATC), or MAX A/C and OFF if equipped with manual A/C.

Air distribution within the vehicle is determined by the function selector switch position, if equipped with manual A/C. If equipped with EATC, air distribution is controlled by the HVAC module in the AUTOMATIC mode, but it can be overridden by the driver if desired. Airflow mode doors are used to direct airflow within the plenum chamber. Vacuum control motors are used to position these airflow mode doors. For information concerning system airflow, refer to Section 412-00.

The air distribution system is designed to provide airflow from the defroster duct when no vacuum is applied to any of the vacuum control motors. This is done to make sure defrost is available in the event of a system vacuum leak.

Air enters the passenger compartment from the:

- instrument panel A/C register.
- floor duct.
- defroster duct.
- side window demisters.

The center panel duct, defroster duct and side window demister hoses are supplied together as a single air distribution assembly.

Passenger compartment air is exhausted from the vehicle through open windows or luggage compartment air vents.

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## Control Components

### Electronic Automatic Temperature Control (EATC)

The HVAC module analyzes input from the following major sources:

- Temperature, function and blower selection (made by the vehicle occupants)
- In-vehicle temperature sensor
- Ambient temperature sensor
- Sunload sensor
- Vehicle Speed Sensor (VSS)
- Engine Coolant Temperature (ECT) sensor

Using these inputs, the HVAC module determines the correct conditions for the following outputs:

- A/C clutch engagement
- Blower speed
- Temperature blend door position
- Floor/panel mode door position
- Panel/defrost mode door position
- Air inlet mode door position

### Control System Inputs - Electronic Automatic Temperature Control (EATC)

#### HVAC Module

The HVAC module, located in the instrument panel, has the following features:

- A blower speed override control for manual input
- A vacuum fluorescent display for displaying set temperature, ambient temperature, function and DTCs
- An On-Board Diagnostic (OBD) feature to supply the technician with DTCs. These DTCs direct the technician to the inoperative component

#### Steering Wheel Audio/Climate Control Switch

The steering wheel audio/climate control switch, located on the right side of the steering wheel, allows the driver to adjust the passenger compartment temperature setting. For removal and installation of the steering wheel audio/climate control switch, refer to [Section 415-00](#).

#### Ambient Air Temperature Sensor

The ambient air temperature sensor:

- is located in front of the A/C condenser core near the center of the vehicle.
- contains a thermistor which measures the temperature of outside air as a resistance and sends that reading to the HVAC module.

#### In-Vehicle Temperature Sensor

The in-vehicle temperature sensor operates in the following manner:

- A thermistor in the in-vehicle temperature sensor measures air temperature inside the passenger compartment
- An automatic temperature control sensor hose and elbow is connected between the A/C evaporator housing and the in-vehicle temperature sensor
- The automatic temperature control sensor hose and elbow takes air from the A/C evaporator housing air stream to create a suction in the in-vehicle temperature sensor
- The suction draws in-vehicle air into the in-vehicle temperature sensor and across the thermistor

### **Sunload Sensor**

The A/C sunload sensor:

- is located on the top RH side of the instrument panel above the glove compartment.
- contains a photovoltaic diode that is sensitive to light.

## **Control System Outputs - Electronic Automatic Temperature Control (EATC)**

### **Blower Motor Speed Control**

The blower motor speed control is located on the A/C evaporator housing, in the engine compartment.

- The function of the blower motor speed control is to convert low power signals from the HVAC module to a high current, variable ground feed for the blower motor.
- Blower motor speed is infinitely variable and is controlled by the HVAC module software.
- A delay function provides a gradual increase or decrease in blower motor speed under all conditions.

### **Temperature Blend Door Actuator**

The temperature blend door actuator is located on the top of the plenum housing.

- Its function is to move the air temperature blend door on command from the control assembly.
- The temperature blend door actuator contains a reversible electric motor and a potentiometer. The potentiometer wiper is connected to the actuator output shaft and moves with the output shaft to indicate the position of the air temperature blend door.
- A 5-volt signal is applied to the ends of the potentiometer. The voltage available at the wiper indicates the position of the potentiometer. The expressed value of the actuator wiper voltage is sent to the HVAC module and is matched with the expected value. The control module then drives the actuator motor in the direction necessary to make the actuator wiper voltage agree with the expected voltage.

### **Vacuum Control Motors**

Vacuum control motors are used to move the floor/panel, panel/defrost and air inlet mode doors.

### **Manual Climate Control**

The manual climate control system heats or cools the vehicle interior depending on the function selector switch position and the temperature selected. The function selector position determines heating or cooling and air distribution. The temperature blend control setting determines air temperature.

The manual climate control system components are used to select the following:



- Air inlet source (outside or recirculated).
- Blower motor speed.
- Discharge air temperature (temperature blend).
- Discharge air location (defrost, panel, floor).
- A/C compressor clutch operation.

## **Control System Inputs - Manual Climate Control**

### **Climate Control Assembly**

The climate control assembly has 3 system controls:

- The function selector switch combines a vacuum selector valve with 2 electrical switches to supply battery voltage (B+) to the A/C clutch circuit and the blower motor control circuit
- Temperature selection is accomplished with a potentiometer connected to the temperature blend door actuator. Movement of the control knob from COOL (blue) to WARM (red) causes a corresponding movement on the temperature blend door and determines the temperature that the system will maintain
- The blower motor switch controls blower motor speed by adding or bypassing resistors in the blower motor resistor

## **Control System Outputs - Manual Climate Control**

### **Blower Motor Resistor**

The blower motor resistor has the following features:

- The assembly is located in the engine compartment on the evaporator housing toward the center of the vehicle
- Three resistor elements are mounted on the resistor board to provide 4 blower motor speeds
- Depending on the blower motor switch position, series resistance is added or bypassed in the blower motor circuit to decrease or increase blower motor speed
- A device to prevent overheating (thermal limiter) will open the resistor coil when the temperature reaches 121°C (250°F) interrupting the blower motor operation in all speeds except HI
- The thermal limiter cannot be reset and is not serviceable

### **Temperature Blend Door Actuator**

The temperature blend door actuator has the following features:

- It is a self-controlled electric motor which monitors the position of the temperature control potentiometer in the climate control assembly
- It interprets the temperature control potentiometer signal as the desired temperature blend door position and automatically drives the temperature blend door to that position
- It is located on the top of the plenum chamber

### **Vacuum Control Motors**

Vacuum control motors are used to move the floor/panel, panel/defrost and air inlet mode doors.



## Heating and Ventilation

The heating and defrosting system has the following features:

- Controls the temperature and, during A/C operation, reduces the relative humidity of the air inside the vehicle
- Delivers heated or cooled air to maintain the vehicle interior temperature and comfort level
- Cooling or heating can be adjusted to maintain the desired temperature
- System uses a reheat method to provide conditioned air to the passenger compartment
- The blower motor draws outside air through the air inlet duct from just below the windshield during all system operations except for MAX A/C cooling (when recirculated air is used)
- All airflow from the blower motor passes through the A/C evaporator core
- Regulates the temperature by reheating a portion of the air and blending it with the remaining cool air to the desired temperature
- The temperature blending is varied by the air temperature blend door, which regulates the amount of air that flows through and around the heater core, where it is then mixed and distributed
- Engine coolant flow through the heater core is prohibited by the heater control valve when the system is set to MAX A/C (manual climate control), or as determined by the HVAC module in the AUTOMATIC mode

### Heater Core

The heater core consists of fins and tubes arranged to extract heat from the engine coolant and transfer it to air passing through the heater core.

### Blower Motor

The blower motor pulls air from the air inlet and forces it into the plenum assembly where it is mixed and distributed.

### Heater Control Valve

The heater control valve is actuated by the air inlet door vacuum control motor circuit (manual climate control) or the heater control valve vacuum control circuit if equipped with Electronic Automatic Temperature Control (EATC). When the heater control valve is closed (full vacuum), coolant flow through the heater core is cut off and A/C cooling efficiency is increased.

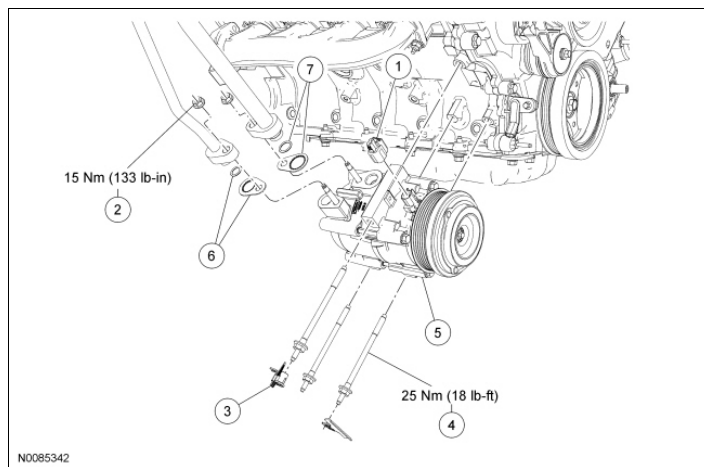
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**Air Conditioning (A/C) Compressor**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	-	Field coil electrical connector (part of 12B637)
2	W520413	A/C compressor fitting nut (2 required)
3	12B637	Wire harness retainer (2 required)
4	W707821	A/C compressor stud bolt (3 required)
5	19703	A/C compressor
6	19B596	O-ring seal and gasket seal kit
7	19B596	O-ring seal and gasket seal kit

**Removal and Installation**

**NOTICE:** If installing a new Air Conditioning (A/C) compressor due to an internal failure of the old unit, and there is evidence of debris that escaped from the compressor, the following procedures must be carried out to remove contamination from the A/C system.

- If A/C flushing equipment is available, carry out the flushing of the A/C system prior to installing a new A/C compressor. For additional information, refer to [Section 412-00](#).
- If A/C flushing equipment is not available, carry out filtering of the A/C system after a new A/C compressor has been installed. For additional information, refer to [Section 412-00](#).
- Install a new evaporator core orifice as directed by the A/C flushing or filtering procedure.
- Install a new suction accumulator as directed by the A/C flushing or filtering procedure.

**NOTE:** Installation of a new suction accumulator is not required when repairing the A/C system, except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator. Damage to the suction accumulator includes leaks in the suction accumulator, physical damage to the suction accumulator shell or desiccant, or moisture contamination. Moisture contamination results only

from a complete loss of refrigerant and equalization of the refrigerant system pressure with atmospheric pressure for a period longer than one hour. If even a slight amount of positive refrigerant pressure is present in the system before repairs are carried out, the suction accumulator should not be replaced.

1. If flushing of the A/C system has not been carried out, recover the refrigerant. For additional information, refer to Section 412-00 .
2. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

3. Remove the drive belt from the A/C compressor pulley.
4. Disconnect the field coil electrical connector.
5. Remove the 2 A/C compressor fitting nuts and disconnect the fittings.
  - Discard the gasket seals and O-ring seals.
  - To install, tighten to 15 Nm (133 lb-in).
6. **NOTE:** The upper rear and lower rear A/C compressor studs must be removed with the A/C compressor.

Remove the 3 A/C compressor studs bolts.

- To install, tighten to 25 Nm (18 lb-ft).

7. Remove the A/C compressor.
8. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

To install, reverse the removal procedure.

- Install new O-ring seals and gasket seals.
- If filtering of the refrigerant system is not to be carried out, lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

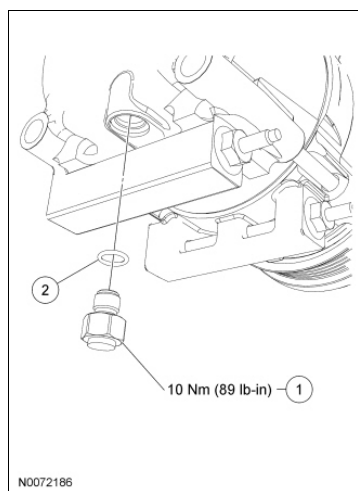
9. If filtering of the refrigerant system is not to be carried out, evacuate, charge and leak test the refrigerant system. For additional information, refer to Section 412-00 .



**Air Conditioning (A/C) Pressure Relief Valve**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	19D644	A/C compressor pressure relief valve
2	-	O-ring seal (part of 19D644)

**Removal and Installation**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
2. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
3. Remove the A/C compressor pressure relief valve and O-ring seal.
  - To install, tighten to 10 Nm (89 lb-in).
4. **NOTE:** A new O-ring seal will already be installed on the new A/C pressure relief valve service part.  
 To install, reverse the removal procedure.
  - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#).
5. Evacuate, leak test and charge the refrigerant system. For additional information, refer to [Section 412-00](#).





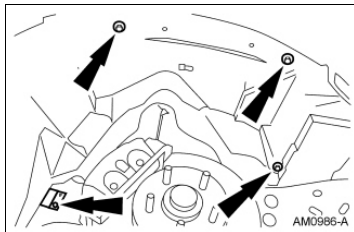
## Air Inlet Duct

### Removal and Installation

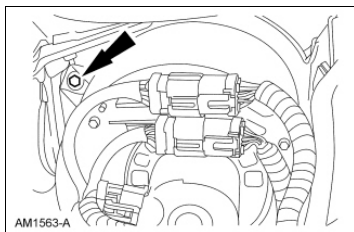
1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .

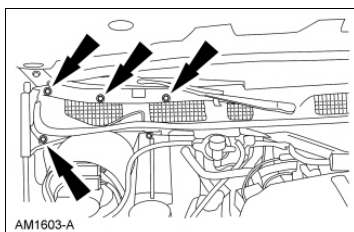
2. Remove the plenum chamber. For additional information, refer to Plenum Chamber in this section.
3. Remove the RH front wheel and tire.
4. Remove the bolts and reposition the fender apron.



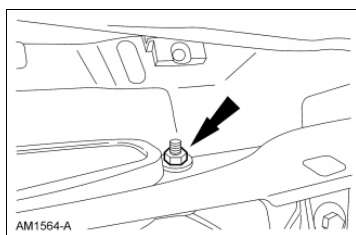
5. Remove the bolt.



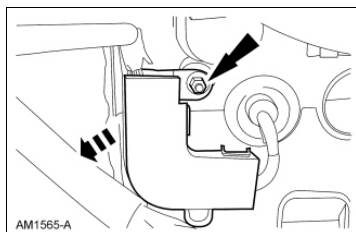
6. Remove the screws and the pin-type retainer and reposition the cowl top cover to access the air inlet duct nut.



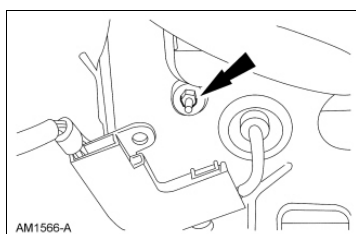
7. Remove the nut.



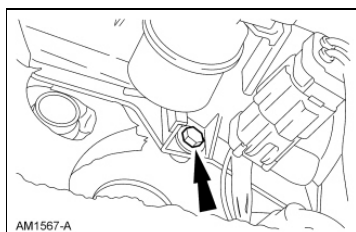
8. Remove the nut and position the harness cover aside.



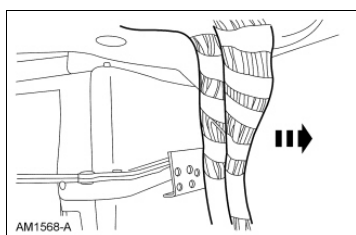
9. Remove the nut.



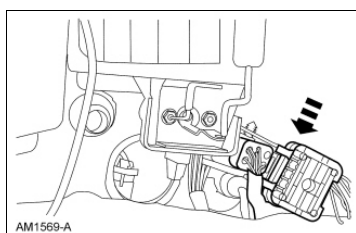
10. Inside the vehicle, remove the bolt.




11. Detach the wire harness.



12. Detach the electrical connectors and remove the air inlet duct.



13.  **WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.

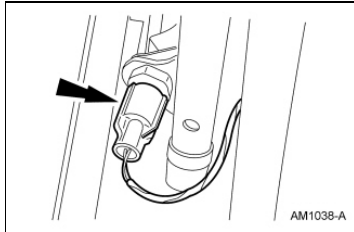
To install, reverse the removal procedure.

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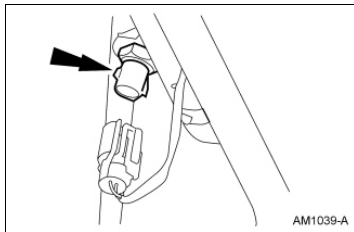
## Ambient Air Temperature Sensor

### Removal and Installation

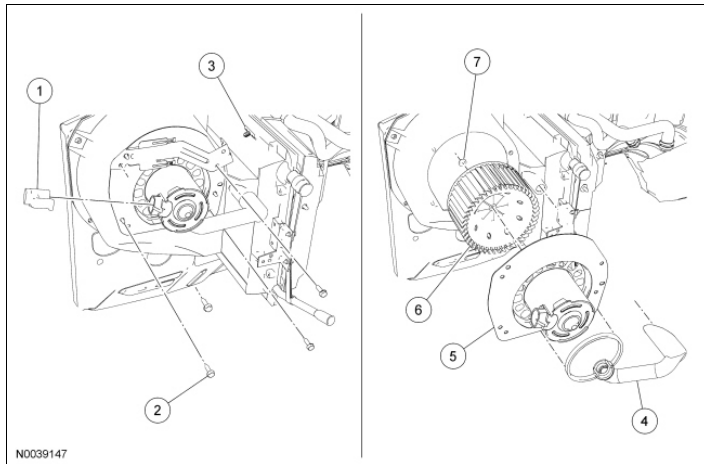
1. Remove the upper radiator sight shield.
2. Disconnect the electrical connector.



3. Remove the ambient air temperature sensor.



4. To install, reverse the removal procedure.
-

**Blower Motor**

Item	Part Number	Description
1	-	Blower motor electrical connector (part of 14290)
2	W701696	Blower motor screw (4 required)
3	-	Wire harness pin-type retainer (part of 14290)
4	19A786	Blower motor vent tube
5	19805	Blower motor
6	19834	Blower motor wheel
7	18A287	Blower motor wheel clip

**Removal and Installation**

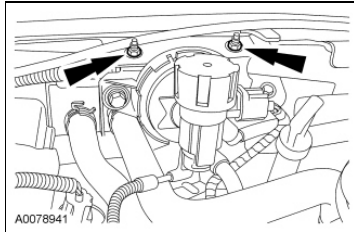
1. Disconnect the blower motor electrical connector.
2. Detach the wire harness pin-type retainer above the blower motor.
3. Remove the blower motor vent tube.
4. Remove 4 blower motor screws.
5. Remove the blower motor.
6. **NOTICE:** Prior to removing a wheel that is to be reused, clean any corrosion from the blower motor shaft to prevent damage to the wheel mounting shaft.  
  
Remove the blower motor wheel clip.
7. Remove the blower motor wheel.
8. To install, reverse the removal procedure.



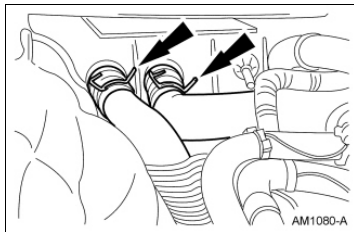
## Blower Motor Speed Control

### Removal and Installation

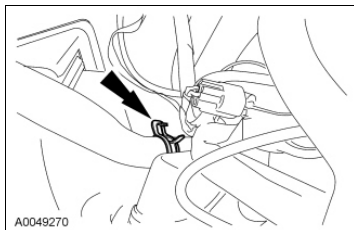
1. Drain the engine coolant. For additional information, refer to [Section 303-03](#).
2. Remove the nuts and position the Evaporative Emission (EVAP) canister purge valve aside.



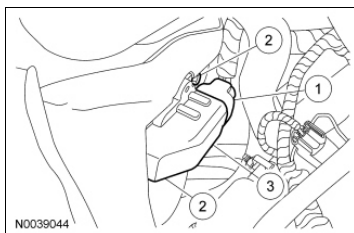
3. Release the clamps and disconnect the heater hoses from the heater core.



4. Release the clamp and remove the heater hose.



5. Remove the blower motor speed control.
  1. Disconnect the blower motor speed control electrical connector.
  2. Remove the 2 blower motor speed control screws.
  3. Remove the blower motor speed control.



6. To install, reverse the removal procedure.

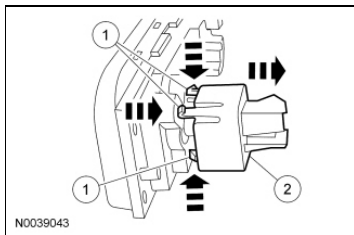




## Blower Motor Switch

### Removal and Installation

1. Remove the climate control assembly. For additional information, refer to [Climate Control Assembly](#) in this section.
2. Pull and remove the blower motor switch knob.
3. Remove the blower motor switch.
  1. Release the 3 tabs.
  2. Remove the blower motor switch.

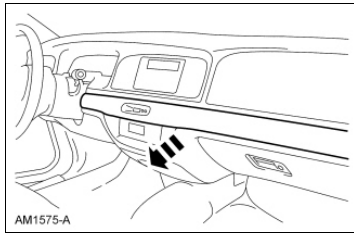


4. To install, reverse the removal procedure.
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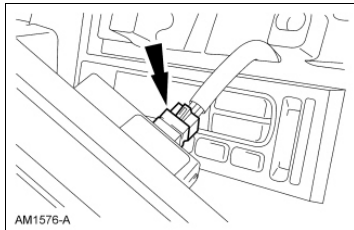
## Climate Control Assembly

### Removal and Installation

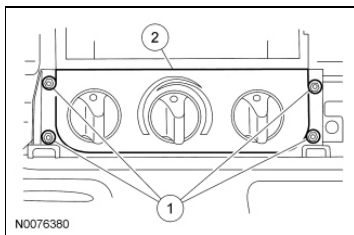
1. Depower the Supplemental Restraint System (SRS). For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B.
2. Detach the finish panel.



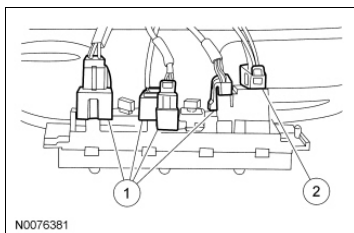
3. Disconnect the electrical connector.



4. Reposition the climate control assembly.
  1. Remove the 4 climate control assembly screws.
  2. Position the climate control assembly rearward.



5. Remove the climate control assembly.
  1. Disconnect the electrical connectors.
  2. Disconnect the vacuum connector and remove the climate control assembly.








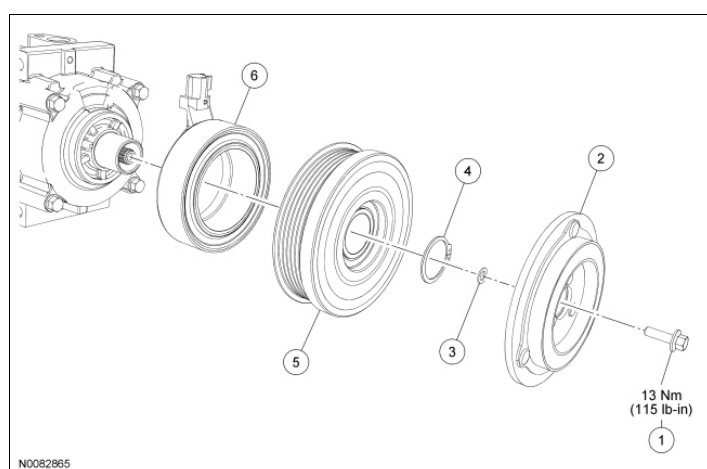
6. To install, reverse the removal procedure.



**Clutch and Clutch Field Coil**

## Special Tool(s)

 ST1232-A	Coil Replacer 412-065 (T89P-19623-EH)
 ST1233-A	Field Coil Remover 412-067 (T89P-19623-FH)
 ST1234-A	Field Coil Replacer 412-078 (T91L-19623-CH)
 ST2946-A	Holding Tool, Compressor Clutch 412-134
 ST2382-A	Remover, Compressor Pulley 412-001 (T71P-19703-B)

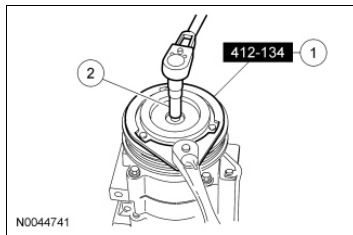


Item	Part Number	Description
1	N805332	A/C clutch disc and hub bolt
2	19D786	A/C clutch disc and hub
3	19D648	A/C clutch disc and hub spacer
4	W701742	A/C compressor pulley snap ring
5	19D784	A/C compressor pulley
6	19D798	A/C clutch field coil

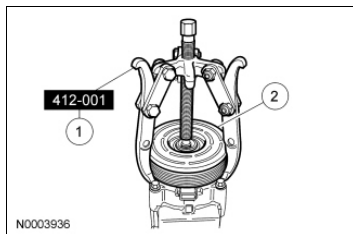
**Removal**

1. Remove the A/C compressor. For additional information, refer to Air Conditioning (A/C) Compressor in this section.
2. Remove the A/C clutch disc and hub bolt.

1. Hold the A/C clutch disc and hub with the Compressor Clutch Holding Tool.
2. Remove the A/C clutch disc and hub bolt.



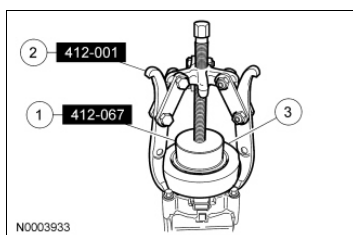
3. Remove the A/C clutch disc and hub.
4. Remove the A/C compressor pulley snap ring.
5. Remove the A/C compressor pulley.
  1. Install the Compressor Pulley Remover.
  2. Remove the A/C compressor pulley.



6. **NOTICE: Do not use air tools. The Air Conditioning (A/C) clutch field coil may be easily damaged.**

Remove the A/C clutch field coil.

1. Install the Field Coil Remover.
2. Install the Compressor Pulley Remover.
3. Remove the A/C clutch field coil.



## Installation

**NOTE:** If installing a new A/C compressor, the A/C clutch components should be reused unless obvious signs of damage are found. If excessive grooving is found, a new A/C clutch disc and hub and A/C compressor pulley must be installed together. Otherwise, each component can be installed individually where needed.

1. Visually inspect the A/C clutch disc and hub, A/C compressor pulley and A/C clutch field coil for damage.
  - Inspect for physical damage, including cracked or melted components or discoloration due to excessive heat.

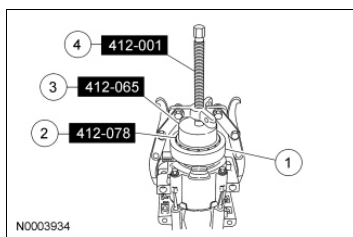
- Inspect for excessive wear, including grooving in the A/C clutch disc and hub or A/C compressor pulley that is more than fingernail depth.
- Inspect for roughness in the A/C compressor pulley bearing.

2. Clean the A/C clutch field coil and pulley mounting surfaces.

3. **NOTICE:** Do not use air tools. The Air Conditioning (A/C) clutch field coil may be easily damaged.

Install the A/C clutch field coil.

1. Place the A/C clutch field coil on the A/C compressor with the A/C clutch field coil electrical connector correctly positioned.
2. Place the Field Coil Replacer on the A/C clutch field coil.
3. Place the Coil Replacer on the Field Coil Replacer.
4. Use the Compressor Pulley Remover to install the A/C clutch field coil.



4. **NOTE:** The A/C clutch pulley is a tight fit on the A/C compressor head. It must be correctly aligned during installation.

Install the A/C clutch pulley.

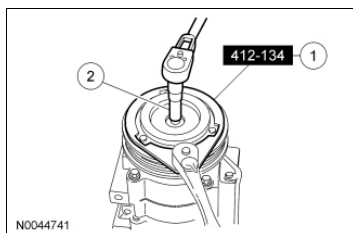
5. Install the A/C clutch pulley snap ring with the bevel side out.

6. Place one nominal thickness A/C clutch disc and hub spacer inside the clutch hub spline opening.

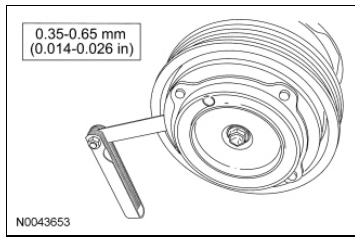
7. Install the A/C clutch disc and hub assembly.

8. Install the A/C clutch disc and hub bolt.

1. Hold the A/C clutch disc and hub with the Compressor Clutch Holding Tool.
2. Install the A/C clutch disc and hub bolt.
  - Tighten to 13 Nm (115 lb-in).



9. Measure and adjust the clutch air gap by removing or adding A/C clutch hub spacers.



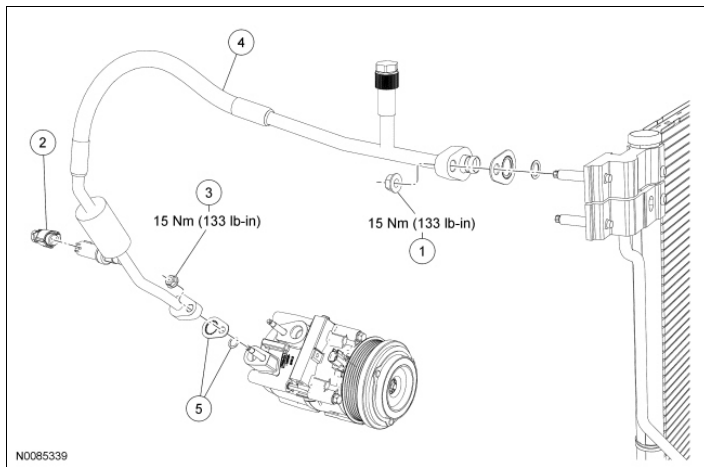
10. Install the A/C compressor. For additional information, refer to Air Conditioning (A/C) Compressor in this section.
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**Compressor to Condenser Discharge Line**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	W520413	Condenser inlet fitting nut
2	12B637	A/C pressure transducer electrical connector
3	W520413	Compressor discharge fitting nut
4	19972	Compressor-to-condenser discharge line
5	19B596	O-ring seal and gasket seal kit (2 required)

**Removal and Installation**

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the condenser inlet fitting nut and disconnect the fitting.
  - Discard the O-ring seal and gasket seal.
  - To install, tighten to 15 Nm (133 lb-in).
3. Disconnect the A/C pressure transducer electrical connector.
4. Remove the compressor discharge fitting nut and disconnect the fitting.
  - Discard the O-ring seal and gasket seal.
  - To install, tighten to 15 Nm (133 lb-in).
5. Remove the compressor-to-condenser discharge line.
6. To install, reverse the removal procedure.
  - Install new gasket seals and O-ring seals.

## 2010 Crown Victoria, Grand Marquis Workshop Manual

- Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .

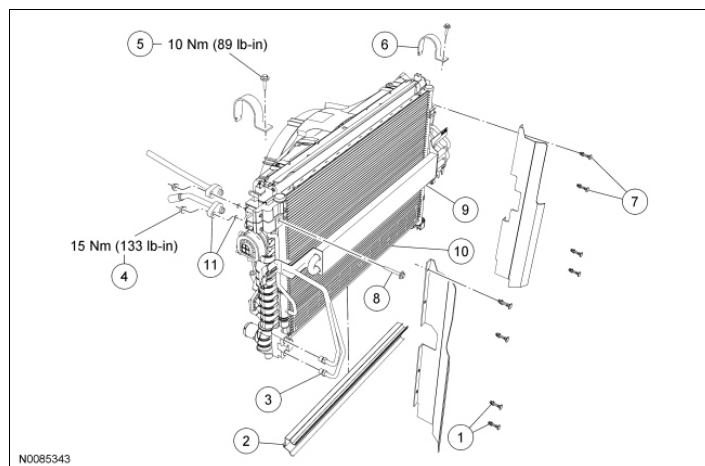
7. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .

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**Condenser Core**

## Material

Item	Specification
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	4026213	Lower side air deflector pin-type retainers (4 required)
2	19E572	Bottom cooling module air deflector
3	7A031	Transmission cooler line fitting (2 required)
4	W520413	Condenser fitting nut (2 required)
5	N606676	Cooling module bracket bolt (2 required)
6	8A193	Cooling module bracket (2 required)
7	4026213	Upper side air deflector pin-type retainers (4 required)
8	W505428	Condenser bolt
9	3D746	Power steering cooler
10	19712	Condenser core
11	19B596	O-ring seal and gasket seal kit (2 required)

**Removal and Installation**

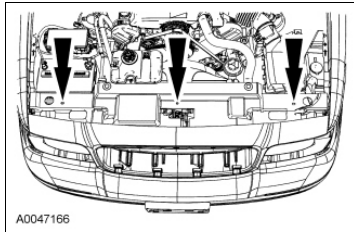
**NOTE:** The condenser core is a combination cooler with the bottom rows being used as an Oil-To-Air (OTA) transmission cooler. If a new A/C condenser is being installed to correct a suspected refrigerant leak due to fluorescent dye being found on the condenser, it should be verified that the dye is not a result of a

transmission fluid leak.

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

3. Remove the pin-type retainers and the radiator upper sight shield.



4. Remove the 4 lower side air deflector pin-type retainers.
5. Remove the bottom cooling module air deflector.
6. Disconnect the 2 transmission cooler line fittings at the condenser.
7. Remove the 2 condenser fitting nuts and disconnect the fittings.
  - Discard the O-ring seals and gasket seals.
  - To install, tighten to 15 Nm (133 lb-in).
8. Remove the 4 upper side air deflector pin-type retainers.
9. Remove the 2 cooling module bracket bolts.
  - To install, tighten to 10 Nm (89 lb-in).
10. Remove the 2 cooling module brackets.
11. Remove the condenser bolt.
12. Detach the power steering cooler from the cooling module clips.
13. Tilt the cooling module back and remove the condenser core.
14. **⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#). Failure to follow these instructions may result in serious personal injury.

To install, reverse the removal procedure.

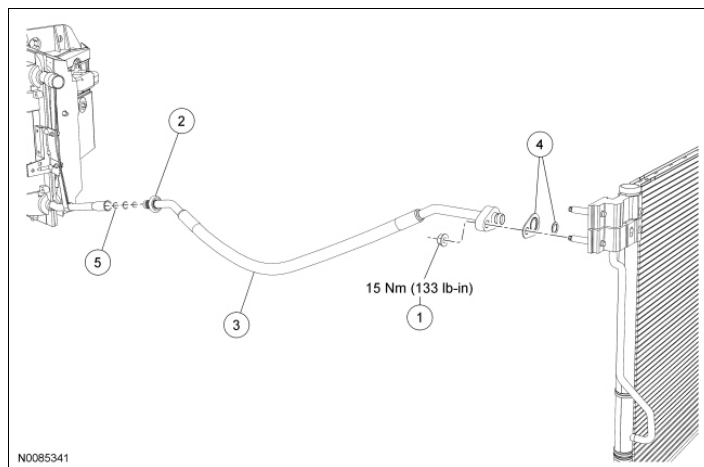
- Install new O-ring seals and gasket seals.
- Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#).

15. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .
  16. Fill the transmission fluid to the correct level. For additional information, refer to Section 307-01 .
-

**Condenser to Evaporator Line**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	W520413	Condenser outlet fitting nut (part of 19835)
2	-	Evaporator inlet fitting (part of 19835)
3	19835	Condenser-to-evaporator line
4	19B596	O-ring seal and gasket seal kit
5	19E889	O-ring seal (3 required)

**Removal and Installation**

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Remove the condenser outlet fitting nut and disconnect the fitting.
  - Discard the O-ring seal and gasket seal.
  - To install, tighten to 15 Nm (133 lb-in).
3. Disconnect the evaporator core inlet fitting.
  - Discard the O-ring seals.
4. Remove the condenser-to-evaporator line.
5. To install, reverse the removal procedure.
  - Install a new gasket seal and O-ring seals.
  - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#).

6. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00.
-

## Evaporator Core

### Removal and Installation

**NOTE:** The evaporator core is not separately serviceable. It is serviced only with the evaporator core housing assembly.

**NOTE:** If an evaporator core leak is suspected, the evaporator core must be leak tested before it is removed from the vehicle. For additional information, refer to Section 412-00.

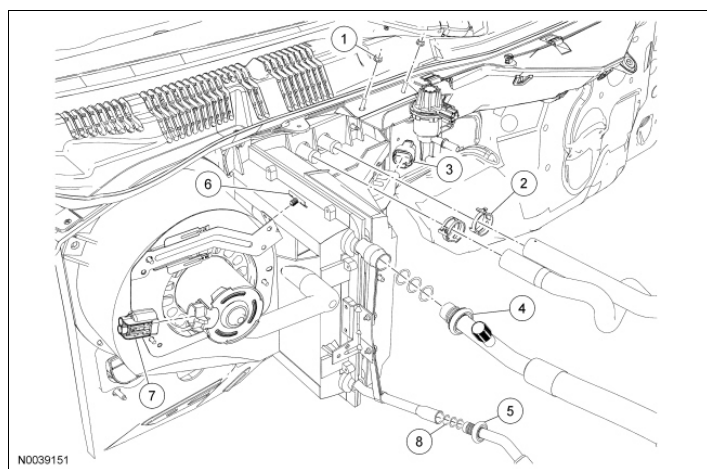
1. Remove the evaporator core housing. For additional information, refer to Evaporator Core Housing in this section.
  2. Transfer the components from the old evaporator core housing to the new evaporator core housing.
  3. Install the evaporator core housing. For additional information, refer to Evaporator Core Housing in this section.
-



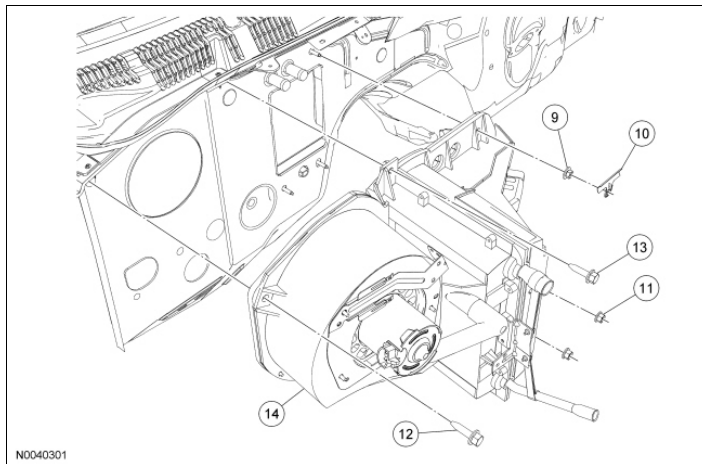
**Evaporator Core Housing**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	N620479	Evaporative Emission (EVAP) canister purge valve bracket nut (2 required)
2	8287	Heater hose clamp (2 required)
3	-	Blower motor speed control electrical connector (part of 14290)
4	-	Evaporator outlet fitting (part of 19835)
5	-	Evaporator inlet fitting (part of 19835)
6	-	Wire harness pin-type retainer (part of 14290)
7	-	Blower motor electrical connector (part of 14290)
8	19E889	O-ring seal (6 required)



Item	Part Number	Description
9	N621906	Upper evaporator core housing nut
10	-	Wire harness retainer (part of 14290)
11	N621906	Lower evaporator core housing nut (2 required)
12	56956	RH evaporator core housing bolt
13	386877	LH evaporator core housing bolt
14	19850	Evaporator core housing

### Removal and Installation

**NOTE:** If an evaporator core leak is suspected, the evaporator core must be vacuum-leak tested before it is removed from the vehicle. For additional information, refer to [Section 412-00](#).

#### All vehicles

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in [Section 100-02B](#). Failure to follow the instructions may result in serious personal injury.

Remove the RH fender splash shield. For additional information, refer to [Section 501-02](#).

3. Drain the engine coolant. For additional information, refer to [Section 303-03](#).
4. Remove the 2 lower evaporator core housing nuts.
5. Remove the 2 Evaporative Emission (EVAP) canister purge valve bracket nuts and position the bracket away from the evaporator core housing.
6. Release the 2 heater hose clamps and disconnect the heater hoses from the heater core.
7. **NOTE:** Blower motor speed control electrical connector shown in exploded view, blower motor resistor electrical connector similar.

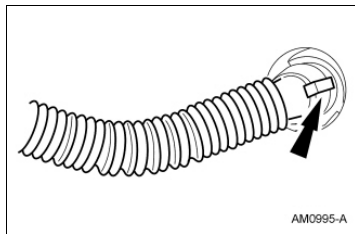
Disconnect the blower motor speed control (if equipped) or blower motor resistor (if equipped) electrical connector.

8. Disconnect the evaporator outlet fitting.
  - Discard the O-ring seals.

9. Disconnect the evaporator inlet fitting.
  - Discard the O-ring seals.
10. Disconnect the blower motor electrical connector.
11. Detach the wire harness pin-type retainer above the blower motor.
12. Detach the wire harness retainer from the evaporator core housing stud.
13. Remove the upper evaporator core housing nut.

**Vehicles equipped with Electronic Automatic Temperature Control (EATC)**

14. Remove the RH lower instrument panel insulator.
15. Disconnect the in-vehicle temperature sensor aspirator hose from the evaporator housing (if equipped).



**All vehicles**

16. Remove the RH evaporator core housing bolt.
17. Remove the LH evaporator core housing bolt.
18. Remove the evaporator core housing.
19. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**



To install, reverse the removal procedure.

- Clean and lubricate the coolant hoses with plain water only if needed.
  - Install new O-ring seals.
  - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to Section 412-00 .
20. Fill the engine cooling system. For additional information, refer to Section 303-03 .
  21. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00 .



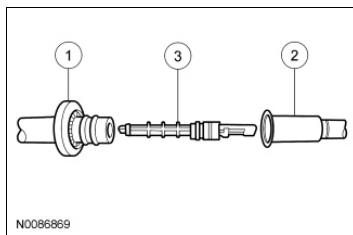
**Evaporator Core Orifice**

## Special Tool(s)

 ST1223-A	Remover, Broken Orifice 412-035 (T83L-19990-B)
 ST1224-A	Remover/Installer, Fixed Orifice 412-034 (T38L-19990-A)

## Material

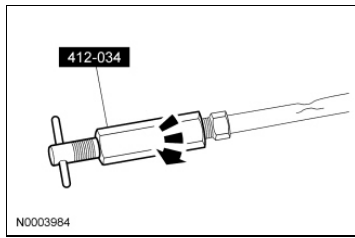
Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



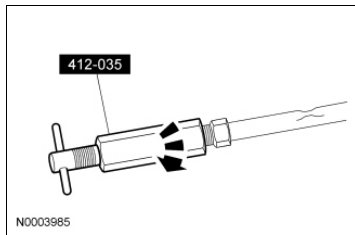
Item	Part Number	Description
1	19835	Condenser-to-evaporator line
2	-	Evaporator inlet tube (part of 19860)
3	19D990	Evaporator core orifice

**Removal**

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Disconnect the condenser-to-evaporator line fitting at the evaporator inlet tube.
  - Discard the O-ring seals.
3. Inspect the evaporator core orifice for damage before attempting to remove it from the evaporator core inlet line.
4. If the evaporator core orifice is intact, engage the Fixed Orifice Remover/Installer. Hold the T-handle stationary while rotating the tool body to remove the evaporator core orifice.

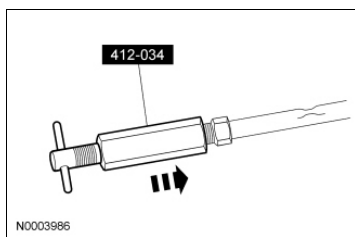


5. If the evaporator core orifice is broken, screw the end of the Broken Orifice Remover into the broken orifice. Hold the T-handle stationary while rotating the tool body to remove the evaporator core orifice.



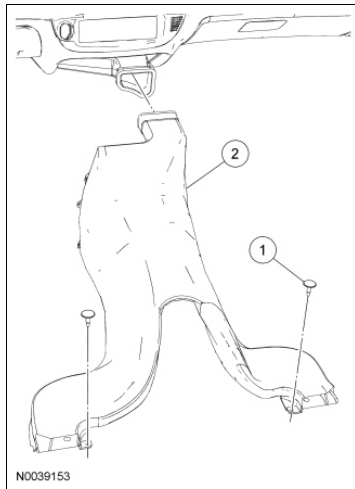
### Installation

1. Lubricate the evaporator core orifice O-ring seals with clean PAG oil and install the evaporator core orifice using the Fixed Orifice Remover/Installer.



2. Install new O-ring seals and connect the condenser-to-evaporator line fitting at the evaporator inlet tube.
3. Evacuate, leak test and charge the refrigerant system. For additional information, refer to [Section 412-00](#).



**Footwell Duct - Rear**

Item	Part Number	Description
1	389358	Rear footwell duct pin-type retainer (2 required)
2	18C420	Rear footwell duct

**Removal and Installation**

1. Remove the front seats. For additional information, refer to [Section 501-10](#).
2. Position the carpet away from the rear footwell duct.
3. Remove the 2 rear footwell duct pin-type retainers.
4. To install, reverse the removal procedure.

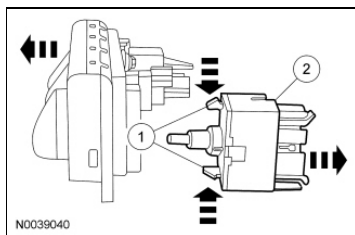




## Function Selector Switch

### Removal and Installation

1. Remove the climate control assembly. For additional information, refer to Climate Control Assembly in this section.
2. Pull and remove the function selector switch knob.
3. Remove the function selector switch.
  1. Release the tabs.
  2. Remove the function selector switch.



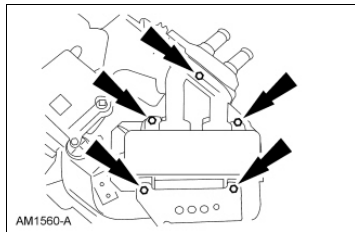
4. To install, reverse the removal procedure.
-

## Heater Core

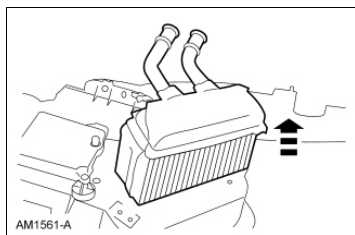
### Removal and Installation

**NOTE:** If a heater core leak is suspected, the heater core must be leak tested before it is removed from the vehicle. For additional information, refer to [Section 412-00](#) .

1. Remove the plenum chamber. For additional information, refer to [Plenum Chamber](#) in this section.
2. Remove the screws and the heater core cover.



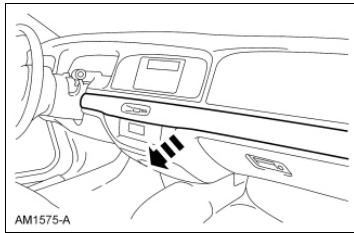
3. Carefully cut the seal above the heater core inlet and outlet tubes and remove the heater core.



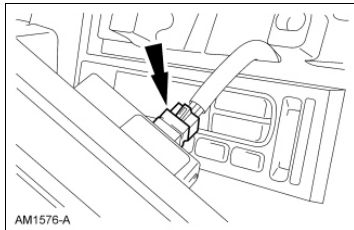
4. To install, reverse the removal procedure.

**Heating Ventilation Air Conditioning (HVAC) Module****Removal and Installation**

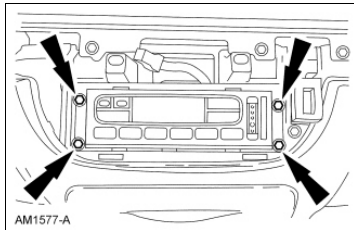
1. Depower the Supplemental Restraint System (SRS). For additional information, refer to Supplemental Restraint System (SRS) Depowering and Repowering in the General Procedures portion of Section 501-20B.
2. Detach the finish panel.



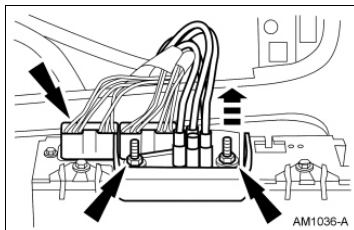
3. Disconnect the electrical connector.



4. Remove the 4 HVAC module screws.



5. Remove the HVAC module.
  - Remove the nuts and disconnect the vacuum harness.
  - Disconnect the wire harness connectors and remove the HVAC module.



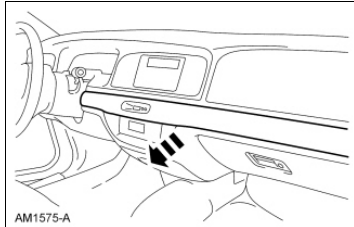
6. To install, reverse the removal procedure.



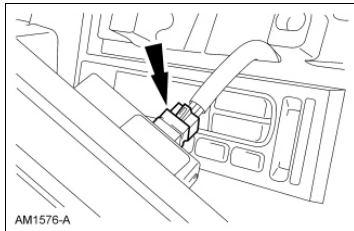
## In-Vehicle Temperature Sensor

### Removal and Installation

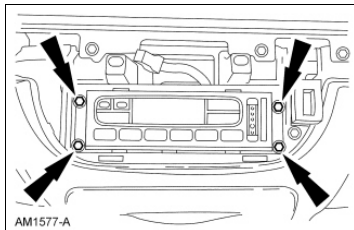
1. Detach the finish panel.



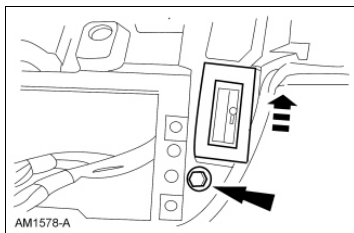
2. Disconnect the electrical connector.



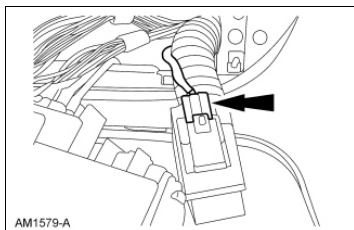
3. Remove the 4 HVAC module screws and pull the HVAC module away from the instrument panel.



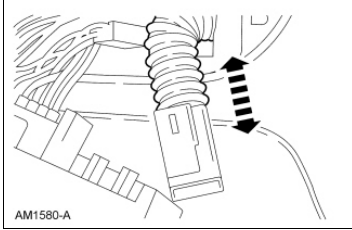
4. Remove the screw and position the in-vehicle temperature sensor to access the electrical connector.



5. Disconnect the connector.

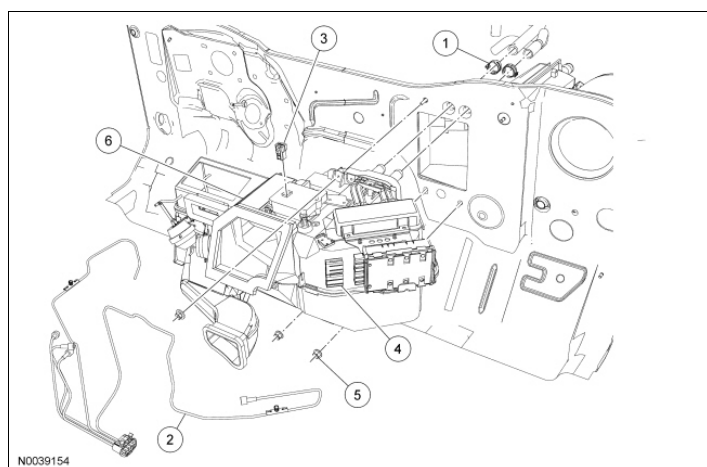


6. Disconnect the aspirator hose and remove the in-vehicle temperature sensor.



7. To install, reverse the removal procedure.

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**Plenum Chamber**

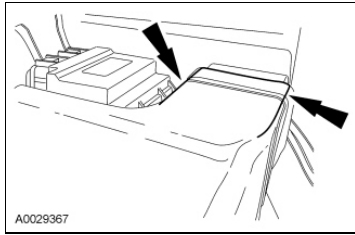
Item	Part Number	Description
1	8287	Heater hose clamp (2 required)
2	19C827	Plenum chamber vacuum harness
3	14A005	Temperature blend door actuator electrical connector
4	14A005	Air suspension module electrical connector (2 required)
5	45332	Plenum chamber nut (3 required)
6	18471	Plenum chamber

**Removal and Installation**

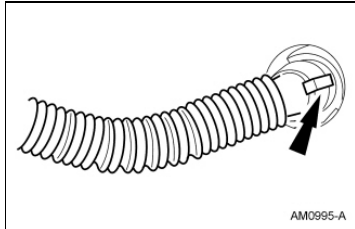
1. Remove the instrument panel. For additional information, refer to [Section 501-12](#) .
2. Drain the engine coolant. For additional information, refer to [Section 303-03](#) .
3. Release the 2 heater hose clamps and disconnect the heater hoses at the heater core.
4. Detach the plenum chamber vacuum harness from the plenum chamber.
5. Disconnect the temperature blend door actuator electrical connector.
6. Disconnect the 2 air suspension control module electrical connectors.
7. Remove the 3 plenum chamber nuts.
8. **NOTICE: Do not excessively cut the rear footwell duct. Make sure to only cut the rear footwell duct to the point that allows the heater floor duct to be removed with the plenum chamber as an assembly.**

Position back the carpet from the plenum chamber. Cut each side of the rear footwell duct and bend back the duct.





9. Remove the in-vehicle temperature sensor aspirator hose (if equipped).



10. Remove the plenum chamber.

11. **NOTE:** Make sure to sufficiently seal the rear footwell duct to the heater outlet floor duct.

To install, reverse the removal procedure.

- Clean and lubricate the coolant hose with plain water only if needed.
- Close the rear footwell duct around the heater outlet floor duct, install a tie strap and position back the carpet.

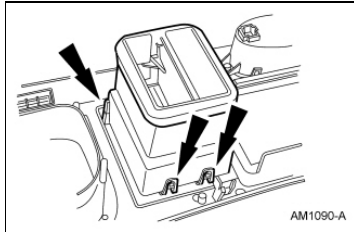
12. Fill the engine cooling system. For additional information, refer to [Section 303-03](#) .

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## Register - Driver Side and Center

### Removal and Installation

1. Remove the instrument cluster finish panel. For additional information, refer to [Section 501-12](#) .
2. Disengage the tabs and remove the register.

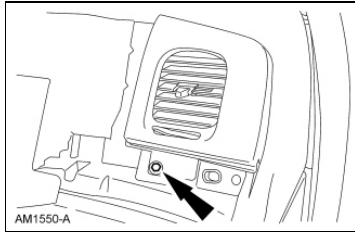


3. To install, reverse the removal procedure.
-

## Register - Passenger Side

### Removal and Installation

1. Remove the passenger airbag module. For additional information, refer to [Section 501-20B](#).
2. Remove the screw and the passenger side register.

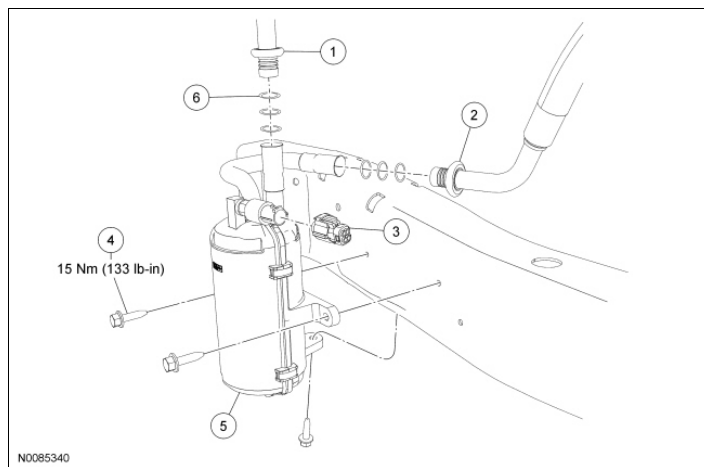


3. To install, reverse the removal procedure.
-

**Suction Accumulator**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B




Item	Part Number	Description
1	-	Suction accumulator outlet fitting (part of 19867)
2	-	Suction accumulator inlet fitting (part of 19835)
3	-	A/C cycling switch electrical connector (part of 12B637)
4	N808809	Suction accumulator bolt (3 required)
5	19C836	Suction accumulator
6	19E889	O-ring seal (6 required)

**Removal and Installation**

**NOTE:** Installation of a new suction accumulator is not required when repairing the A/C system, except when there is physical evidence of contamination from a failed A/C compressor or damage to the suction accumulator. Damage to the suction accumulator includes leaks in the suction accumulator, physical damage to the suction accumulator shell or desiccant, or moisture contamination. Moisture contamination results only from a complete loss of refrigerant and equalization of the refrigerant system pressure with atmospheric pressure for a period longer than one hour. If even a slight amount of positive refrigerant pressure is present in the system before repairs are carried out, the suction accumulator should not be replaced.

1. **⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

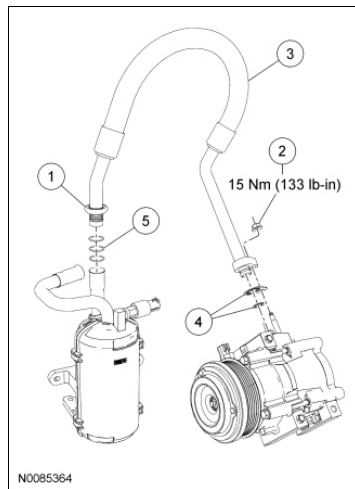
With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **Section 100-02A** .

2. Recover the refrigerant. For additional information, refer to [Section 412-00](#) .
  3. Disconnect the suction accumulator outlet fitting.
    - Discard the O-ring seals.
  4. Disconnect the suction accumulator inlet fitting.
    - Discard the O-ring seals.
  5. Disconnect the A/C cycling switch electrical connector.
  6. Remove the 3 suction accumulator bolts.
    - To install, tighten to 15 Nm (133 lb-in).
  7. Remove the suction accumulator.
  8.  **WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.**
- To install, reverse the removal procedure.
- Install new O-ring seals.
  - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#) .
9. Evacuate, leak test and charge the refrigerant system. For additional information, refer to [Section 412-00](#) .
-

**Suction Accumulator to Compressor Line**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	-	Suction accumulator outlet fitting (part of 19867)
2	W520413	Compressor suction fitting nut
3	19867	Suction accumulator-to-compressor line
4	19B596	O-ring seal and gasket seal kit
5	19E889	O-ring seal (3 required)

**Removal and Installation**

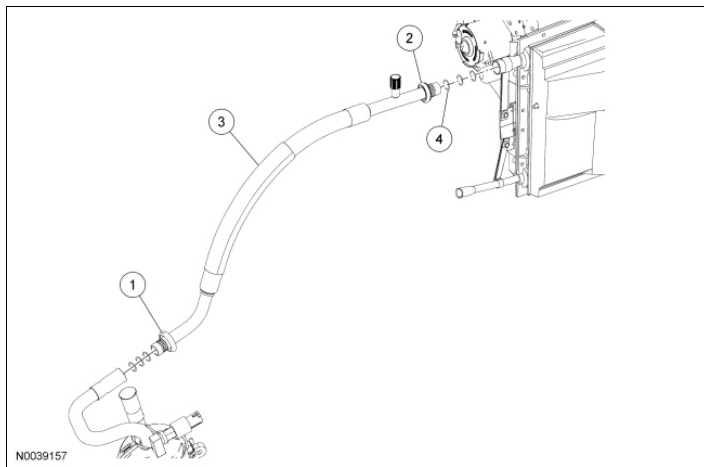
1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Disconnect the suction accumulator outlet fitting.
  - Discard the O-ring seals.
3. Remove the compressor suction fitting nut and disconnect the fitting.
  - Discard the O-ring seal and gasket seal.
  - To install, tighten to 15 Nm (133 lb-in).
4. Remove the suction accumulator-to-compressor line.
5. To install, reverse the removal procedure.
  - Install a new gasket seal and O-ring seals.
  - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#).

6. Evacuate, leak test and charge the refrigerant system. For additional information, refer to Section 412-00.
-

**Suction Accumulator To Evaporator Line**

## Material

Item	Specification
PAG Refrigerant Compressor Oil (R-134a Systems) YN-12-D	WSH-M1C231-B



Item	Part Number	Description
1	-	Suction accumulator inlet fitting (part of 19835)
2	-	Evaporator core outlet fitting (part of 19835)
3	19835	Suction accumulator-to-evaporator line
4	19E889	O-ring seal (6 required)

**Removal and Installation**

1. Recover the refrigerant. For additional information, refer to [Section 412-00](#).
2. Disconnect the suction accumulator inlet fitting.
  - Discard the O-ring seals.
3. Disconnect the evaporator core outlet fitting.
  - Discard the O-ring seals.
4. Remove the suction accumulator-to-evaporator line.
5. To install, reverse the removal procedure.
  - Install new O-ring seals.
  - Lubricate the refrigerant system with the correct amount of clean PAG oil. For additional information, refer to [Section 412-00](#).
6. Evacuate, leak test and charge the refrigerant system. For additional information, refer to [Section 412-00](#).

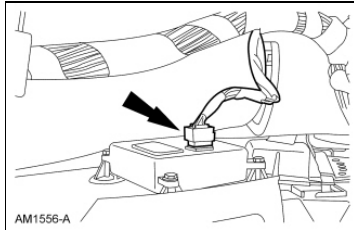




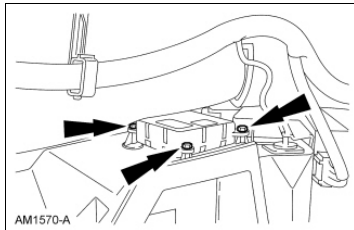
## Temperature Blend Door Actuator

### Removal and Installation

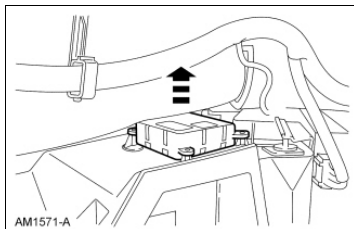
1. Remove the instrument panel. For additional information, refer to [Section 501-12](#) .
2. Disconnect the temperature blend door actuator electrical connector.



3. Remove the 4 temperature blend door actuator screws.



4. Remove the temperature blend door actuator.



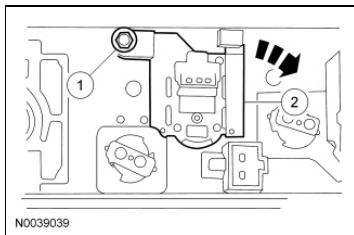
5. To install, reverse the removal procedure.



## Temperature Control Switch

### Removal and Installation

1. Remove the climate control assembly. For additional information, refer to [Climate Control Assembly](#) in this section.
2. Pull and remove the temperature control switch knob.
3. Remove the temperature control switch.
  1. Remove the screw.
  2. Rotate and remove the temperature control switch.

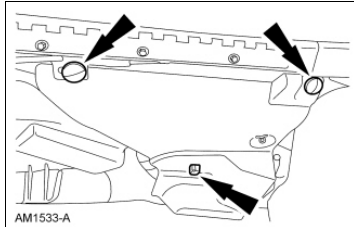


4. To install, reverse the removal procedure.
-

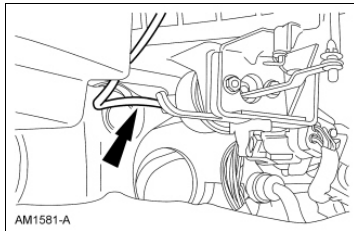
## Vacuum Control Motor - Air Inlet Door

### Removal and Installation

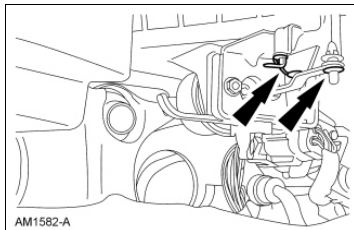
1. Remove the pin-type retainers and the instrument panel lower insulator.



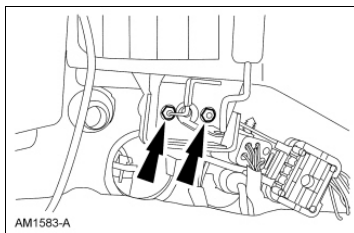
2. Disconnect the air inlet door vacuum control motor vacuum connector.



3. Remove the control arm clip and the spring.



4. Remove the nuts and the air inlet door vacuum control motor.



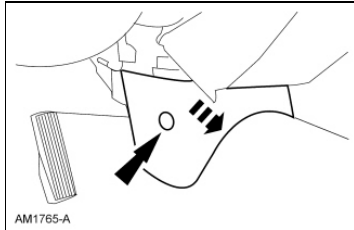
5. To install, reverse the removal procedure.



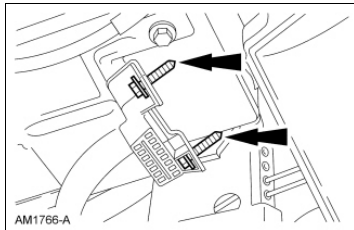
## Vacuum Control Motor - Floor Defrost Door

### Removal and Installation

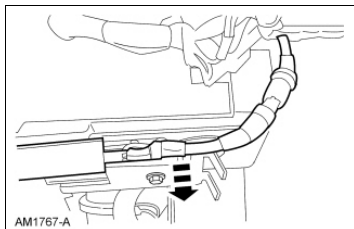
1. Remove the LH lower instrument panel insulator.
2. Remove the 2 pin-type retainers and the trim panel.



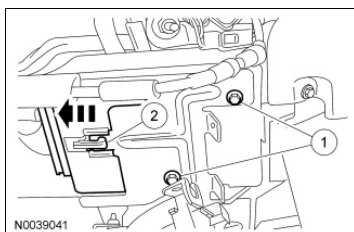
3. Remove the 2 Data Link Connector (DLC) screws.



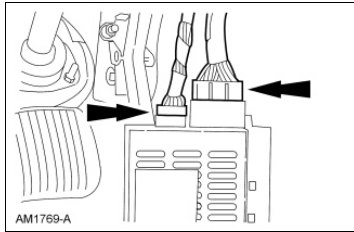
4. Detach the vacuum line.



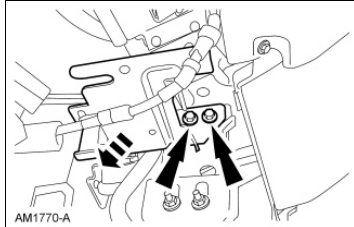
5. Remove the Lighting Control Module (LCM).
  1. Remove the screws.
  2. Disengage the clip.
  - Remove the LCM .



6. Disconnect the electrical connectors.

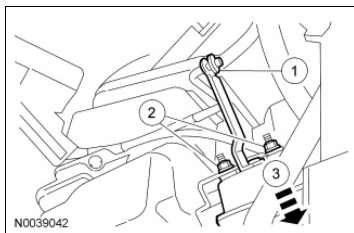


7. Remove the screws and the LCM bracket.

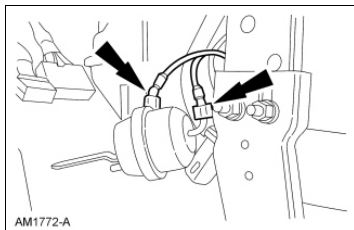


8. Remove the floor/defrost door vacuum control motor.

1. Remove the clip.
2. Remove the 2 floor/defrost door vacuum control motor nuts.
3. Remove the floor/defrost door vacuum control motor.



9. Disconnect the floor/defrost door vacuum control motor vacuum connectors.



10. To install, reverse the removal procedure.

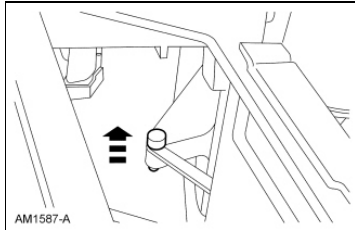




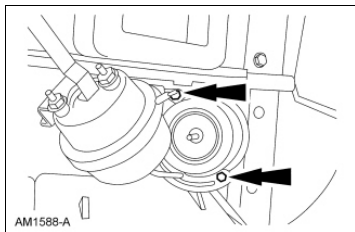
## Vacuum Control Motor - Panel Door

### Removal and Installation

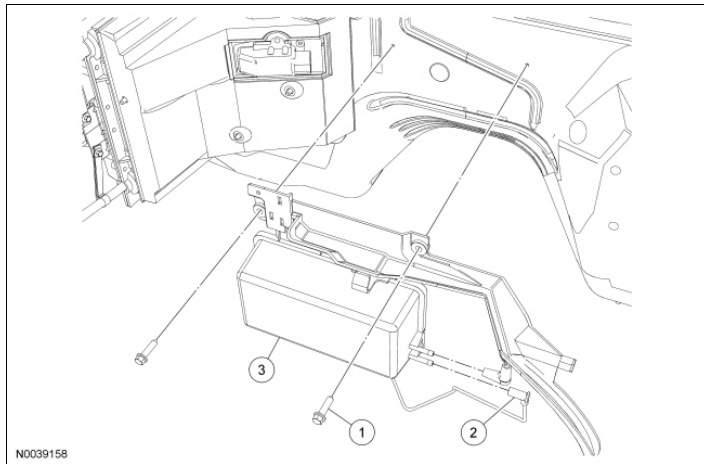
1. Remove the instrument panel. For additional information, refer to [Section 501-12](#) .
2. Reach through the door opening and remove the pin.



3. Disconnect the panel door vacuum control motor vacuum connector.
4. Remove the 2 screws and the panel door vacuum control motor.



5. To install, reverse the removal procedure.
-

**Vacuum Reservoir**

Item	Part Number	Description
1	N610961	Vacuum reservoir screw (2 required)
2	19C827	Vacuum reservoir vacuum connector (2 required)
3	9C490	Vacuum reservoir

**Removal and Installation**

1. Remove the wiper mounting arm and pivot shaft. For additional information, refer to [Section 501-16](#).
2. Disconnect the 2 vacuum reservoir vacuum connectors.
3. Remove the 2 vacuum reservoir retaining screws.
4. Remove the vacuum reservoir.
5. To install, reverse the removal procedure.






## **Instrument Cluster and Panel Illumination**

The instrument cluster and panel lamp system illuminates the following:

- Audio unit
  - HVAC module (automatic temperature control)
  - Climate control assembly (manual temperature control)
  - Traction control switch (if equipped)
  - Adjustable pedal switch
  - Headlamp switch
  - Instrument Cluster (IC)
  - Rear window defrost switch
  - Message center switch
  - Steering wheel switches
  - Window control switches
  - Door lock control switches
  - Heated seat control switch
-

**Instrument Cluster and Panel Illumination**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST3063-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation****Dimmable Backlighting**

The Lighting Control Module (LCM) generates a variable Pulse Width Modulated (PWM) voltage and the Driver Door Module (DDM) generates a variable voltage which is distributed to the dimmable components when the parking lamps are on.

**NOTE:** The DDM provides the variable voltage to the HVAC module for the brightness level of the display. Light intensity is adjusted by rotating the instrument panel dimmer switch. The dimmable backlighting components consist of:

- Audio unit
- HVAC module (automatic temperature control)
- Climate control assembly (manual temperature control)
- Traction control switch (if equipped)
- Floor shifter (if equipped)
- Headlamp switch
- Instrument Cluster (IC)
- Rear window defrost switch
- Message center switch
- Steering wheel switches

The LCM communicates backlighting intensity level on the Standard Corporate Protocol (SCP) network to the Instrument Cluster (IC) and the DDM. The DDM provides variable voltage to the HVAC module for vehicles equipped with automatic temperature control.

**Fixed Level Backlighting**

The following components have fixed level backlighting that is illuminated when the ignition switch is in the RUN or ACC position:

- Window control switches
- Door lock control switch
- Heated seat control switch

### Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Instrument panel dimmer switch</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):                             <ul style="list-style-type: none"> <li>◆ 4 (10A)</li> <li>◆ 9 (7.5A)</li> </ul> </li> <li>• Bulbs</li> <li>• Wiring, terminals or connectors</li> <li>• Lighting Control Module (LCM)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:
  - Verify the ignition key is in the ON position.
  - Verify the scan tool operation with a known good vehicle.
  - Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.
  - If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
  - If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .
9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### Lighting Control Module (LCM) DTC Chart

DTC	Description	Action
B2212	Panel Dim Switch Out Of Range	<u>GO to Pinpoint Test A</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: The Dimmable Illumination Does Not Dim

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

### Normal Operation

The Lighting Control Module (LCM) supplies a Pulse Width Modulated (PWM) voltage to the instrument panel switches (except the HVAC module on vehicles with automatic temperature control and the Instrument Cluster (IC) which receive the brightness level from the LCM over the network). The LCM uses the instrument panel dimmer switch to determine the intensity of switch illumination.

- DTC B2212 (Panel Dim Switch Out of Range) - an on-demand DTC that sets when the SJB LCM detects an out of range condition on the dimmer input switch circuit.

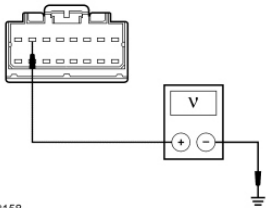
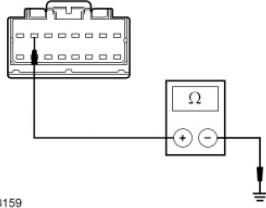
**This pinpoint test is intended to diagnose the following:**

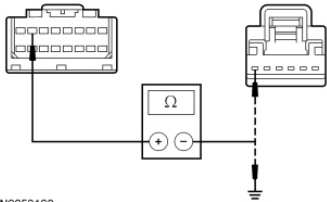
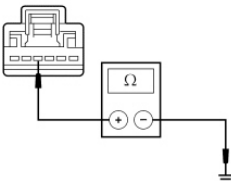
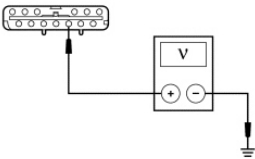
- Wiring, terminals or connectors
- Instrument panel dimmer switch
- LCM



**PINPOINT TEST A: THE DIMMABLE ILLUMINATION DOES NOT DIM**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>A1 CHECK DTCs FROM THE LCM</b>	
<ul style="list-style-type: none"> <li>• Check the recorded results from the LCM self-test.</li> <li>• Is DTC B2212 recorded?</li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> GO to <u>A6</u> .</p>
<b>A2 CHECK THE INSTRUMENT PANEL DIMMER SWITCH SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the LCM C2145a-7, circuit 1036 (BN/WH), harness side and ground.</li> </ul>  <p><b>Is any voltage present?</b></p>	<p><b>Yes</b> REPAIR circuit 1036 (BN/WH) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 VERIFY DTC B2212</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Ignition OFF.</li> <li>• While rotating the instrument panel dimmer switch wheel from the maximum setting to the minimum setting, measure the resistance between the LCM C2145a-7, circuit 1036 (BN/WH), harness side and ground.</li> </ul>  <p><b>Does the resistance vary between 545 ohms and 25 ohms?</b></p>	<p><b>Yes</b> GO to <u>A7</u> .</p> <p><b>No</b> GO to <u>A4</u> .</p>
<b>A4 CHECK THE INSTRUMENT PANEL DIMMER SWITCH SIGNAL CIRCUIT FOR AN OPEN OR SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Instrument Panel Dimmer Switch C205b.</li> <li>• Measure the resistance between the LCM C2145a-7, circuit 1036 (BN/WH), harness side and the instrument panel dimmer switch C205b-6, circuit 1036 (BN/WH), harness side; and between the LCM C2145a-7, circuit 1036 (BN/WH), harness side and ground.</li> </ul>  <p>N0053160</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the LCM and the instrument panel dimmer switch, and greater than 10,000 ohms between the LCM and ground?</li> </ul>	<p><b>Yes</b> GO to <u>A5</u> .</p> <p><b>No</b> REPAIR circuit 1036 (BN/WH) for an open or short to ground. TEST the system for normal operation.</p>
<p><b>A5 CHECK INSTRUMENT PANEL DIMMER SWITCH GROUND CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the instrument panel dimmer switch C205b-4, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0044212</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new instrument panel dimmer switch. REFER to <u>Instrument Panel Dimmer Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<p><b>A6 CHECK THE LCM DIMMABLE OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the LCM C2145c-3, circuit 484 (OG/BK), harness side and ground.</li> </ul>  <p>A0045076</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 484 (OG/BK) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A7</u> .</p>
<p><b>A7 CHECK FOR CORRECT LCM OPERATION</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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**Pinpoint Test B: All Dimmable Switch Illumination Is Inoperative**

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

**Normal Operation**

The Lighting Control Module (LCM) receives voltage from the Central Junction Box (CJB). With the parking lamps on, the LCM generates a Pulse Width Modulated (PWM) voltage which is distributed to the dimmable components (except the HVAC module on vehicles with automatic temperature control and the Instrument Cluster (IC) which receive the brightness level from the LCM over the network).

**This pinpoint test is intended to diagnose the following:**

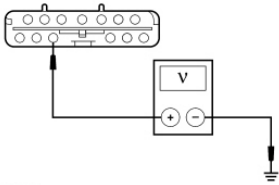
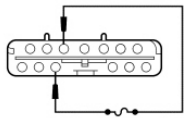
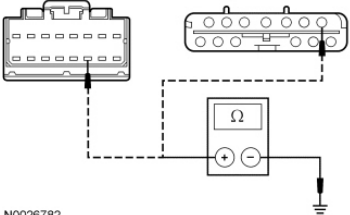
- Fuse
- Wiring, terminals or connectors
- LCM

**PINPOINT TEST B: ALL DIMMABLE SWITCH ILLUMINATION IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>B1 CHECK THE LCM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Measure the voltage between the LCM C2145c-17, circuit 905 (GY/LB), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> VERIFY the CJB fuse 4 (10A) is OK. If OK, REPAIR circuit 905 (GY/LB) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>

 <p>N0053484</p> <p>• Is the voltage greater than 10 volts?</p>	
<b>B2 BYPASS THE LCM</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> If the fuse fails, refer to the Wiring Diagrams Manual to identify the cause of the circuit short.</li> <li>• Connect a fused jumper wire between the LCM C2145c-17, circuit 905 (GY/LB), harness side and the LCM C2145c-3, circuit 484 (OG/BK), harness side.</li> </ul>  <p>N0053485</p> <p>• Do the instrument panel lamps illuminate?</p>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> REPAIR circuit 484 (OG/BK) for an open. TEST the system for normal operation.</p>
<b>B3 CHECK THE LCM GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the LCM C2145a-11, circuit 676 (PK/OG), harness side and ground; and between the LCM C2145c-7, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0026782</p> <p>• Are the resistances less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>B4</u> .</p> <p><b>No</b> REPAIR circuit 676 (PK/OG) for an open. TEST the system for normal operation.</p>
<b>B4 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose</p>

<ul style="list-style-type: none"> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	or corroded connector.
--	------------------------

### Pinpoint Test C: The Instrument Cluster (IC) Illumination Is Inoperative

#### Normal Operation

The Lighting Control Module (LCM) communicates the requested level of backlighting intensity to the Instrument Cluster (IC) through the Standard Corporate Protocol (SCP) network.

**This pinpoint test is intended to diagnose the following:**

- IC
- LCM

#### PINPOINT TEST C: THE IC ILLUMINATION IS INOPERATIVE

Test Step	Result / Action to Take
<b>C1 CHECK THE IC FOR CORRECT ILLUMINATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Carry out the network test.</li> <li>• <b>Does the scan tool respond with no communication with the IC ?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 418-00</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Section 413-01</u> . TEST the system for normal operation.</p>

### Pinpoint Test D: The HVAC Module/Climate Control Assembly Illumination Is Inoperative

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

#### Normal Operation

With the parking lamps on, the Lighting Control Module (LCM) supplies a variable Pulse Width Modulated (PWM) voltage to the HVAC module (automatic temperature control) or to the climate dimmable assembly (manual temperature control). On vehicles with automatic temperature control, the Driver Door Module (DDM) also generates a secondary variable voltage which is distributed to the HVAC module for the brightness level of the display.

**This pinpoint test is intended to diagnose the following:**

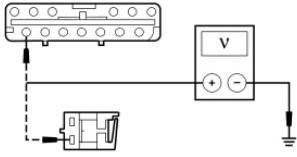
- Wiring, terminals or connectors
- HVAC module (automatic temperature control)
- Climate dimmable assembly (manual temperature control)
- DDM

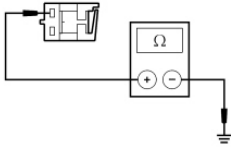
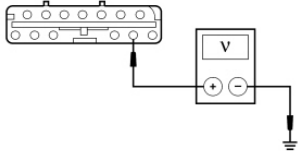
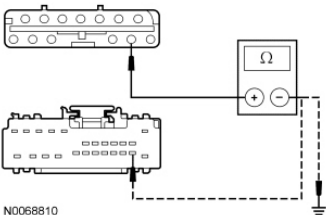
**PINPOINT TEST D: THE HVAC MODULE/CLIMATE CONTROL ASSEMBLY ILLUMINATION IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

**NOTE:** Verify the climate control assembly bulb is OK before starting diagnostics.

Test Step	Result / Action to Take
<b>D1 CHECK THE HVAC MODULE AND CLIMATE CONTROL ASSEMBLY INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: HVAC Module C228b (Automatic Temperature Control).</li> <li>• Disconnect: Climate Dimmable Assembly C294d (Manual Temperature Control).</li> <li>• Ignition ON.</li> <li>• With the parking lamps on, rotate the instrument panel dimmer switch to the maximum brightness position.</li> <li>• Measure the voltage between the HVAC module (automatic temperature control) C228b-14, circuit 484 (OG/BK), harness side and ground; or between the climate dimmable assembly (manual temperature control) C294d-1, circuit 484 (OG/BK), harness side and ground.</li> </ul>  <p>A0045874</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> If equipped with automatic temperature control, GO to <a href="#">D3</a> .  If equipped with manual temperature control, GO to <a href="#">D2</a> .</p> <p><b>No</b> REPAIR circuit 484 (OG/BK) for an open. TEST the system for normal operation.</p>
<b>D2 CHECK THE CLIMATE DIMMABLE ASSEMBLY GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the climate control assembly C294d-2, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new climate control assembly module. REFER to <a href="#">Section 412-01</a> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>

 <p>A0045876</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>D3 CHECK FOR VOLTAGE TO THE HVAC MODULE FROM THE DDM</b>	
<ul style="list-style-type: none"> <li>• Disconnect: HVAC Module C228a.</li> <li>• Measure the voltage between the HVAC module C228a-19, circuit 19 (LB/RD), harness side and ground.</li> </ul>  <p>A0045875</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>D6</u> .</p> <p><b>No</b> GO to <u>D4</u> .</p>
<b>D4 CHECK THE HVAC MODULE INPUT CIRCUIT FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Place the headlamp switch in the OFF position.</li> <li>• Disconnect: DDM C501b.</li> <li>• Measure the resistance between the HVAC module C228a-19, circuit 19 (LB/RD), harness side and the DDM C501b-14, circuit 19 (LB/RD), harness side; and between the HVAC module C228a-19, circuit 19 (LB/RD), harness side and ground.</li> </ul>  <p>N0068810</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the HVAC module and the DDM , and greater than 10,000 ohms between the HVAC module and ground?</li> </ul>	<p><b>Yes</b> GO to <u>D5</u> .</p> <p><b>No</b> REPAIR circuit 19 (LB/RD) for an open or short to ground. TEST the system for normal operation.</p>
<b>D5 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p>

<ul style="list-style-type: none"> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>No</b></p> <p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>D6 CHECK FOR CORRECT HVAC MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the HVAC module connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the HVAC module connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b></p> <p>INSTALL a new HVAC module. REFER to <u>Section 412-01</u> . TEST the system for normal operation.</p> <p><b>No</b></p> <p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test E: The Audio Unit Illumination Is Inoperative**

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

**Normal Operation**

With the parking lamps on, the Lighting Control Module (LCM) supplies a variable Pulse Width Modulated (PWM) voltage to the audio unit.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Audio unit

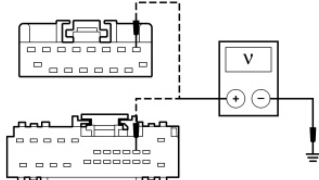
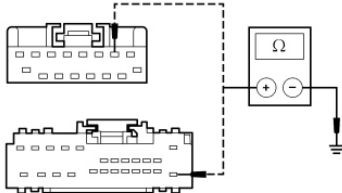
**PINPOINT TEST E: THE AUDIO UNIT ILLUMINATION IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>E1 CHECK THE ACM INPUT CIRCUIT FOR AN OPEN</b>	



<ul style="list-style-type: none"> <li>• Disconnect: Audio Unit C290a or C240.</li> <li>• With the parking lamps on, rotate the instrument panel dimmer switch to the maximum brightness position.</li> <li>• Measure the voltage between the audio unit C240-1 (base audio), circuit 484 (OG/BK), harness side and ground; or between the audio unit C290a-3 (Sanyo audio), circuit 484 (OG/BK), harness side and ground.</li> </ul>  <p>A0045895</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> REPAIR circuit 484 (OG/BK) for an open. TEST the system for normal operation.</p>
<p><b>E2 CHECK THE ACM GROUND CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the audio unit C240-2 (base audio), circuit 57 (BK), harness side and ground; or between the audio unit C290a-13 (Sanyo audio), circuit 694 (BK/LG), harness side and ground.</li> </ul>  <p>N0027736</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> REMOVE the audio unit. REFER to <u>Section 415-00</u> . SEND it to an authorized audio system repair facility. TEST the system for normal operation after repair.</p> <p><b>No</b> REPAIR the ground circuit for an open. TEST the system for normal operation.</p>

### Pinpoint Test F: The Steering Wheel Switch(es) Illumination Is Inoperative

Refer to Wiring Diagrams Cell 71 , Cluster and Panel Illumination for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) supplies a variable Pulse Width Modulated (PWM) voltage through the clockspring to the steering wheel switches.

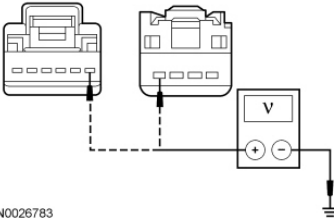
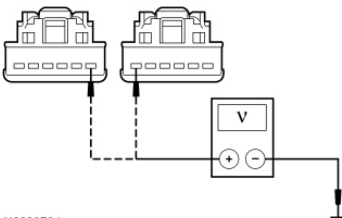
**This pinpoint test is intended to diagnose the following:**

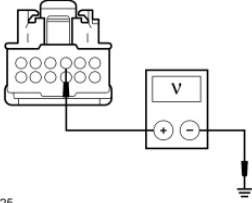
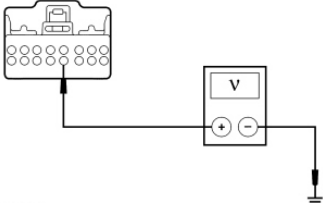
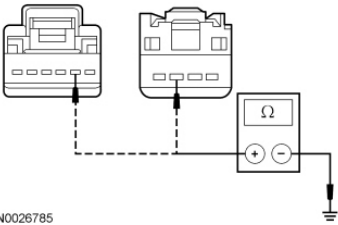
- Wiring, terminals or connectors
- Audio/climate control switch
- Speed control switch
- Steering wheel harness
- Clockspring

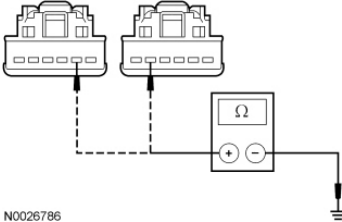
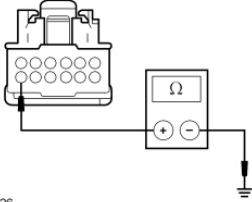
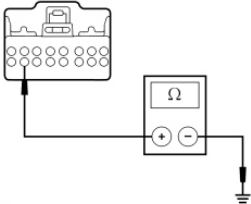
**PINPOINT TEST F: THE STEERING WHEEL SWITCH(ES) ILLUMINATION IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
<b>F1 CHECK THE STEERING WHEEL SWITCH(ES) FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Remove the driver air bag module. Refer to <a href="#">Section 501-20B</a> .</li> <li>• Disconnect: Inoperative Steering Wheel Switch.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Ignition ON.</li> <li>• With the parking lamps on, rotate the instrument panel dimmer switch to the maximum brightness position.</li> <li>• For vehicles equipped with audio/climate control switches, measure the voltage between the speed control switch C203-4, circuit 484 (OG/BK), harness side and ground; or between the audio/climate control switch C2208-1, circuit 484 (OG/BK), harness side and ground.</li> </ul>  <p>N0026783</p> <ul style="list-style-type: none"> <li>• For vehicles without audio/climate control switches, measure the voltage between the speed control on/off switch C2330a-6, circuit 484 (OG/BK), harness side and ground; or between the speed control set switch C2330b-1, circuit 484 (OG/BK), harness side and ground.</li> </ul>  <p>N0026784</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">F4</a> .</p> <p><b>No</b> GO to <a href="#">F2</a> .</p>
<b>F2 CHECK FOR VOLTAGE THROUGH THE CLOCKSPRING</b>	

<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218b.</li> <li>• Measure the voltage between the clockspring C218b pin 4, component side and ground.</li> </ul>  <p>N0027625</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new steering wheel harness. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> GO to <a href="#">F3</a> .</p>
<b>F3 CHECK FOR VOLTAGE TO THE CLOCKSPRING</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• Measure the voltage between the clockspring C218a-12, circuit 484 (OG/BK), harness side and ground.</li> </ul>  <p>N0013020</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 484 (OG/BK) for an open. TEST the system for normal operation.</p>
<b>F4 CHECK FOR GROUND TO THE STEERING WHEEL SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• For vehicles equipped with audio/climate control switches, measure the resistance between the speed control switch C203-3, circuit 57 (BK), harness side and ground; or between the audio/climate control switch C2208-2, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0026785</p> <ul style="list-style-type: none"> <li>• For vehicles without audio/climate control switches, measure the resistance between the speed control on/off switch C2330a-5, circuit 57 (BK), harness side and ground; or between the speed control set switch C2330b-2, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new switch in question. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> GO to <a href="#">F5</a> .</p>

 <p>N0026786</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>F5 CHECK FOR GROUND THROUGH THE CLOCKSPRING</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218b.</li> <li>• Measure the resistance between the clockspring C218b pin 7, component side and ground.</li> </ul>  <p>N0027626</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> REPAIR or INSTALL a new steering wheel harness. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> GO to <a href="#">F6</a> .</p>
<b>F6 CHECK THE CLOCKSPRING GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• Measure the resistance between the clockspring C218a-15, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0026744</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p>

### Pinpoint Test G: One Or More Switch Illumination Is Inoperative

Refer to Wiring Diagrams Cell [71](#) , Cluster and Panel Illumination for schematic and connector information.

Refer to Wiring Diagrams Cell [110](#) , Power Door Locks for schematic and connector information.

Refer to Wiring Diagrams Cell [119](#) , Climate Controlled Seats for schematic and connector information.

**Normal Operation**

The Lighting Control Module (LCM) supplies a variable Pulse Width Modulated (PWM) voltage to the dimmable illumination. With the ignition switch in the ACC or RUN position, voltage is supplied from the Central Junction Box (CJB) to the door lock control switches and heated seat control switches.

**This pinpoint test is intended to diagnose the following:**

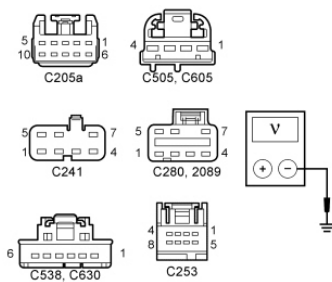
- Fuse
- Wiring, terminals or connectors
- Headlamp switch
- Traction control switch
- Message center switch
- Rear window defrost switch
- Adjustable pedal switch
- Door lock control switch(es)
- Heated seat control switch(es)

**PINPOINT TEST G: ONE OR MORE SWITCH ILLUMINATION IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step		Result / Action to Take
<b>G1 CHECK FOR VOLTAGE TO THE INOPERATIVE COMPONENT</b>		
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Illumination Source.</li> <li>• Ignition ON.</li> <li>• With the parking lamps on, rotate the instrument panel dimmer switch to the maximum brightness position.</li> <li>• Measure the voltage between the inoperative illumination source, harness side and ground as follows:</li> </ul>		<p><b>Yes</b> GO to <u>G2</u> .</p> <p><b>No</b> For the door lock control switches and heated seat control switches, VERIFY that the CJB fuse 9 (7.5A) is OK. If OK, REPAIR circuit 964 (DB/LG) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p> <p>For all others, REPAIR circuit 484 (OG/BK) for an open. TEST the system for normal operation.</p>
<b>Inoperative Illumination Source</b>	<b>Connector-Pin</b>	<b>Circuit</b>
Headlamp switch	C205a-2	484 (OG/BK)
Rear window defrost switch	C241-3	484 (OG/BK)
Driver heated seat control switch	C538-5	964 (DB/LG)
Passenger heated seat control switch	C630-5	964 (DB/LG)

Driver door lock control switch	C505-2	964 (DB/LG)
Passenger door lock control switch	C605-2	964 (DB/LG)
Traction control switch	C280-3	484 (OG/BK)
Adjustable pedal switch	C2089-5	484 (OG/BK)
Message center switch	C253-7	484 (OG/BK)



N0107364

- Is the voltage greater than 10 volts?

## G2 CHECK FOR VOLTAGE TO THE SINGLE ILLUMINATION SOURCE USING THE CONNECTOR GROUND

- Measure the voltage between the inoperative illumination source connector, harness side as follows:

Component	Connector-Pin/ Circuit	Connector-Pin/ Circuit
Headlamp switch	C205a-2 484 (OG/BK)	C205a-1 57 (BK)
Driver door lock control switch	C505-2 964 (DB/LG)	C505-4 57 (BK)
Passenger door lock control switch	C605-2 964 (DB/LG)	C605-4 57 (BK)

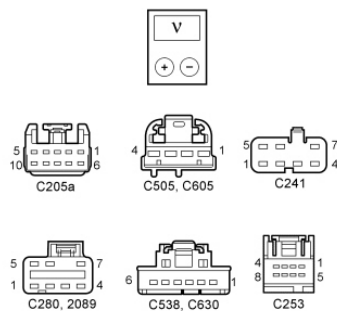
### Yes

INSTALL a new component in question. TEST the system for normal operation.

### No

REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.

Rear window defrost switch	C241-3 484 (OG/BK)	C241-7 57 (BK)
Traction control switch	C280-3 484 (OG/BK)	C280-7 57 (BK)
Adjustable pedal switch	C2089-5 484 (OG/BK)	C2089-4 57 (BK)
Driver heated seat control switch	C538-5 964 (DB/LG)	C538-1 57 (BK)
Passenger heated seat control switch	C630-5 964 (DB/LG)	C630-1 57 (BK)
Message center switch	C253-7 484 (OG/BK)	C253-2 57 (BK)

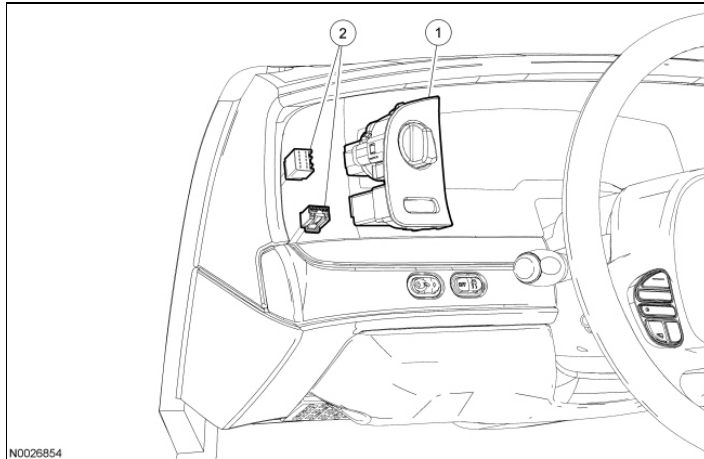


N0107365

- Is the voltage greater than 10 volts?



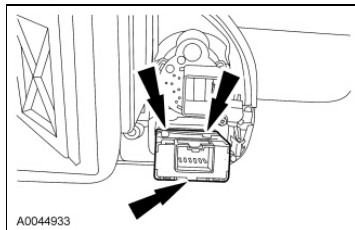


**Instrument Panel Dimmer Switch**

Item	Part Number	Description
1	11654	Headlamp switch assembly
2	-	Headlamp switch electrical connectors (part of 14401)

**Removal and Installation**

1. Remove the headlamp switch.
  - Disconnect the electrical connectors.
2. Release the retaining tabs and remove the instrument panel dimmer switch.



3. To install, reverse the removal procedure.

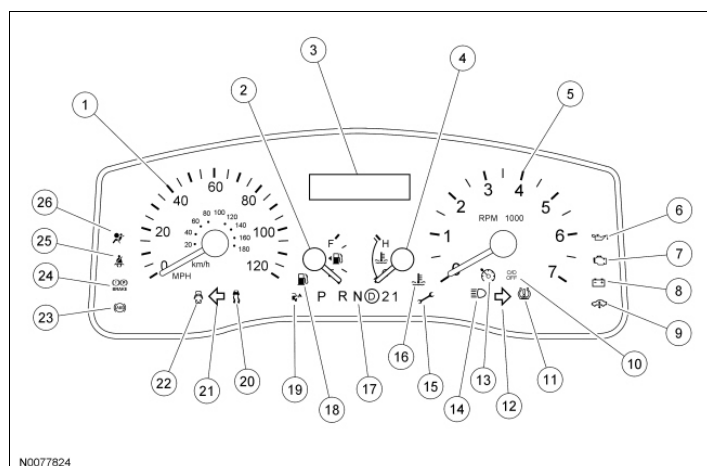


SECTION 413-01: Instrumentation, Message Center, and  
Warning Chimes  
DESCRIPTION AND OPERATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

### Instrument Cluster (IC)

**NOTE:** Base cluster shown, message center cluster similar.



Item	Part Number	Description
1	-	Speedometer
2	-	Fuel gauge
3	-	Message center
4	-	Temperature gauge
5	-	Tachometer
6	-	Low oil pressure warning indicator
7	-	Malfunction Indicator Lamp (MIL)
8	-	Charging system warning indicator
9	-	Air suspension indicator
10	-	Overdrive (O/D) off indicator
11	-	Tire Pressure Monitoring System (TPMS) warning indicator
12	-	RH turn indicator
13	-	Cruise control indicator
14	-	High beam indicator
15	-	Powertrain malfunction (wrench) warning indicator
16	-	Engine over-temperature warning indicator
17	-	PRNDL
18	-	Low fuel warning indicator
19	-	Check fuel cap indicator
20	-	Traction assist indicator
21	-	LH turn indicator
22	-	Door ajar warning indicator
23	-	ABS warning indicator

24	-	Brake warning indicator
25	-	Safety belt warning indicator
26	-	Air bag warning indicator

The Instrument Cluster (IC) is available with either a vacuum florescent display (base cluster) or with a message center (optional cluster). The base IC has an odometer, a trip odometer that can be displayed in either English or Metric units, and an engine idle hour meter (Police only). The odo/trip button is used to select between the odometer, the trip odometer, and the engine idle hour meter (if equipped), to reset the trip odometer or change the units. The message center cluster features include the odometer and the trip odometer functions. The information display occupies either the top 2 or top 3 lines of the message center depending on the font size chosen. These displays are independent of other messages with the exception of the redundant odometer which is shown on the bottom portion of the message center.

Both the base IC and the message center IC contain gauges, indicator lamps, and warning lamps that are designed to provide the driver with a system status and to alert the driver that certain conditions exist in the vehicle. Gauges provide information to the driver indicating the status of systems. Examples of systems that use gauges include vehicle speed, fuel level, engine coolant temperature, and engine rpm. Indicator lamps provide information to the driver of conditions that exist in the vehicle. Examples of the indicator lamps include the turn signal, speed control, and high beams on. Warning indicator lamps provide information to the driver of conditions that could potentially alter vehicle performance. Examples of the warning indicators include the ABS, BRAKE, safety belt, and low oil pressure. The IC lens and mask assembly are the only parts that may be installed separately.

---

## Information And Message Center

The message center is a vacuum fluorescent display, integrated into the non-base Instrument Cluster (IC). The message center functions are controlled by the message center switches. The message center displays important vehicle information by constantly monitoring different vehicle systems. The message center notifies the driver of a potential vehicle concern by displaying a warning message pertaining to the system in which a fault has been detected. Refer to the Owner's Literature for operating instructions.

The message center provides the following features:

- Information displays
- Setup displays
- System warnings

The message center information can be selected through the message center buttons.

### Oil Life and Oil Life Start Value

The oil life is displayed in percentages and is preset to a maximum of approximately 12,070 km (7,500 miles) or 180 days. The oil life start value is used to increase or decrease the starting point of the oil life. The value can be changed back to the maximum of approximately 12,070 km (7,500 miles) if the value was previously changed or to lower the value by 10% increments down to 30%. Each 10% reduction lowers the oil life in both mileage and the days.

For example, if the oil life start value is lowered to 50%, the maximum mileage is 6,035 km (3,750 miles) or 90 days. The oil life remains at the selected setting (50% in this example) until the driver changes the oil life start value. When the oil life ( **not oil life start value** ) is reset back to 100% following an oil change, the oil life resets to 6,035 km (3,750 miles). For configuration of the oil life and oil life start value, refer to Message Center Configuration in this section.

### Information Displays

The information displays are non-timed modes. The selected mode remains on until the driver presses a message center switch to change the mode, or until it is overridden by another mode. The information display modes are:

- Trip odometer A and trip odometer B/odometer
- Distance To Empty (DTE)
- Average fuel economy
- Instantaneous fuel economy
- Elapsed time

### Setup Displays

The setup displays are timed modes and terminate after a finite interval. Press the SETUP button for the following functions:

- System check
- Display (odometer/speedometer)
- Text size (normal/large)

- Units (English/metric)
- Language
- Oil minder start value

### System Check Displays

Selecting this function from the SETUP MENU causes the message center to cycle through each of the systems being monitored. For each of the monitored systems, the message center indicates either an OK message or a warning message for 3 seconds. Pressing the SELECT control switch cycles the message center through each of the systems being monitored. The system check report is as follows:

- OIL LIFE - PRESS RESET IF NEW OIL
- WASHER FLUID
- AIR SUSPENSION
- RECONFIGURABLE TELLTALES
  - ◆ OK
  - ◆ FAILED RED
  - ◆ FAILED AMBER

### System Warnings

The system warnings alert the operator to possible concerns or malfunctions in the vehicle operating systems. In the event of a multiple warning situation, the message center cycles the display to show all warnings, by displaying each message for 4 seconds. The message center displays the last selected feature if there are no more warning messages. This allows the operator full functionality of the message center after acknowledgement of the warning message by pressing the RESET button and clearing the message. The warning messages are divided into 3 categories:

- Cannot be reset until the condition is corrected.
- Reappear on the display 10 minutes from the reset if the condition is not corrected.
- Do not reappear until an ignition off-on cycle is completed.

The warning display that cannot be reset is:

- DOOR AJAR

The warning messages that reoccur after 10 minutes are:

- COOLANT OVER TEMPERATURE
- POWERTRAIN MALFUNCTION
- CHECK FUEL CAP
- LOW FUEL
- CHECK AIR SUSPENSION

The warning messages that can display whenever the ignition switch is turned from the OFF position to the ON position are:

- OVERDRIVE ON/OFF
- TRUNK AJAR
- LOW TIRE PRESSURE
- TIRE PRESSURE MONITOR FAULT
- TIRE PRESSURE SENSOR FAULT
- CHECK COMPASS MODULE
- LOW WASHER FLUID

- CHANGE ENGINE OIL
-

## Warning Chimes

The warning chime sounds to remind or alert the driver:

- to turn the headlamps off when exiting the vehicle.
- to remove the ignition key when exiting the vehicle.
- to close the doors after starting the vehicle.
- to fasten the safety belt after starting the vehicle.
- that a fault is present in the Supplemental Restraint System (SRS).
- that a warning message is displayed on the message center (if equipped).
- that an engine coolant over-temperature condition is present.





The Lighting Control Module (LCM) controls the warning chime function using various inputs to determine when to sound the warning chime. The warning chime sounds if:

- the headlamps are on with the key removed from the ignition lock cylinder and the driver door ajar.
  - the key is in the ignition lock cylinder in the OFF position with the driver door ajar.
  - a door is ajar with the ignition switch in the ON position.
  - the safety belts are not fastened with the ignition switch in the ON position.
  - the ignition switch is in the ON position and an air bag warning chime request is received by the Instrument Cluster (IC) from the Restraints Control Module (RCM).
  - the message center displays a warning message (if equipped).
  - a fail safe cooling chime request message is received from the IC by a request from the PCM.
-



**Instrumentation, Message Center and Warning Chimes**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1473-A	Instrument Gauge System Tester 014-R1063 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

When installing a new Instrument Cluster (IC), it is necessary to upload the module configuration information to the scan tool. Following installation of the IC, download the module configuration information from the scan tool into the new IC. For additional module configuration information, refer to [Section 418-01](#).

The IC is a configurable, hybrid electronic cluster that contains a microprocessor, gauges, indicator lamps, message center, warning chimes and internal circuitry. The IC uses hardwired circuitry, the Standard Corporate Protocol (SCP), and the Controller Area Network (CAN) to transmit and receive data from other modules.

It is very important to understand:

- where the input originates.
- all the information necessary in order for a feature to operate.
- which module(s) receive(s) the input or command message.
- whether the module which received the input controls the output of the feature, or whether it outputs a message over the CAN or SCP communication networks circuits to another module.
- which module controls the output of the feature.

**Instrument Cluster (IC)****IC Messages**

The IC uses input messages from other modules to control the gauges, informational indicators, warning indicators and reconfigurable telltale indicators over the communication networks. If a required message is missing or invalid for less than 5 seconds, the gauge or indicator that requires the message remains at the last commanded state based upon the last known good message. For example, if the brake status message is

missing for less than 5 seconds and the brake warning indicator was ON, the indicator remains in the ON state until the next good message is received. If the message remains missing or invalid for greater than 5 seconds, the IC sets a U-code DTC and the output becomes a default action for the indicator or gauge. Each indicator or gauge utilizes a different default strategy depending on the nature of the indication. If the messaged input to the cluster returns at any time, the normal function of the gauge or indicator resumes.

**NOTE:** Whenever a message is suspected as missing and confirmed by a missing message DTC (U-code), it is important to look for other symptoms that may also be present in the IC and throughout the vehicle. Once a DTC is set in the IC, it may be helpful to review the complete message list available in [Section 418-00](#) to see what other modules also rely on the same message and run the self-test for those modules. If the message is missing from other modules, the same DTC may also be set in those modules. Confirmation of missing messages common to multiple modules may indicate that the originating module is the source of the concern or the communication network may be experiencing some concerns.

### IC Prove-Out

The IC and other vehicle modules carry out a display prove-out to verify that all module controlled warning/indicator lamps and monitored systems are functioning correctly within the IC. When the ignition switch is cycled to the ON position with the engine off, the indicators illuminate to prove-out according to the following table:

Indicator	Indicator Type	Prove-Out Duration
Air bag	Warning	6 seconds on then 2 seconds off
ABS	Warning	3 seconds
Air suspension	Informational	5 seconds
Brake	Warning	3 seconds
Charge	Informational	Engine start up
Check fuel cap	Informational	No prove-out
Door ajar	Warning	No prove-out
Engine over-temperature	Warning	3 seconds
Fire suppression (police only)	Informational	5 seconds
High beam	Informational	No prove-out
Low engine oil pressure	Warning	Engine startup
Low fuel	Informational (if equipped)	3 seconds
Malfunction Indicator Lamp (MIL)	Warning	Engine startup
Overdrive (O/D) off	Informational	No prove-out
Powertrain malfunction (wrench)	Informational	3 seconds
RH/LH turn signals	Informational	No prove-out
Safety belt	Warning	65 seconds if the safety belt is unbuckled, turns off when the safety belt is buckled
Cruise control	Informational	No prove-out
Tire Pressure Monitoring System (TPMS)	Warning	3 seconds
Traction control	Informational	3 seconds

## Information And Message Center

The message center is an integral part of the IC that receives and acts upon much of the same information that is input and used to operate the IC gauges, indicators, warning indicators and reconfigurable telltale indicators. The message center, located in the center of the IC is a Vacuum Fluorescent (VF) 2-line display. The message center electronic functions use both hardwired and the CAN circuitry to transmit and receive information.

## Warning Chimes

The IC uses different chimes to alert the driver of various vehicle conditions as follows:

- Safety belt warning (repetitive chime)
- Belt-Minder® warning (repetitive chime after a delay and after the safety belt chime is completed)
- Key-in-ignition warning (repetitive chime)
- Headlamps on warning (repetitive chime)
- Door ajar warning (single tone chime)
- Air bag warning (repetitive chime)
- Message center warning (single tone)

## Safety Belt Warning Chime

The safety belt warning chime warns that the safety belt is not fastened. The safety belt warning chime sounds when the driver safety belt is not fastened and the ignition key is turned from the OFF/LOCK or ACC to the ON or START position.

The safety belt warning chime stops sounding when the safety belt is fastened, the ignition key is turned from the ON or START position to the OFF/LOCK or ACC position, or the chime sounds for approximately 6 seconds.

The safety belt warning chime inputs are the:

- Ignition switch position
- Driver safety belt switch status signal from the Restraints Control Module (RCM)

## Belt-Minder®

The Belt-Minder® is configurable. To configure using a scan tool, refer to [Section 418-01](#) . To configure without using a scan tool, refer to [Belt-Minder® Deactivating/Activating](#) in this section.

**NOTE:** The Belt-Minder® is disabled for one ignition switch ON cycle if the safety belt is buckled then unbuckled during that specific ignition switch cycle.

The Belt-Minder® feature supplements the current safety belt warning function. The Belt-Minder® is enabled after the current safety belt warning is complete. The Belt-Minder® reminds the driver that the driver or passenger front safety belt is unbuckled by intermittently sounding a chime and illuminating the safety belt warning lamp in the IC once the vehicle speed exceeds 5 km/h (3 mph). While activated, the Belt-Minder® alternates the chime and indicator from on for 6 seconds to off for 30 seconds.

### **Key-In-Ignition Warning Chime**

The key-in-ignition warning chime warns that the key is still in the ignition lock cylinder when the driver door is ajar. The chime sounds when the driver door is ajar, the key is in the ignition lock cylinder and in the OFF/LOCK or ACC position.

The chime stops sounding when the driver door is closed, the key is removed from the ignition lock cylinder, or if the ignition lock cylinder is turned to the ON position.

The key-in-ignition warning chime inputs are the:

- Ignition switch ON position
- Door ajar signal from the driver door ajar switch
- Key-in-ignition switch signal from the ignition switch

### **Headlamps On Warning Chime**

The headlamps on warning chime warns that the headlamps are on when the driver door is ajar and the key is removed from the ignition lock cylinder. The headlamps on warning chime sounds if the driver door is ajar, the headlamp switch is in the HEADLAMPS or PARKING LAMPS ON position, and the ignition key is in the OFF/LOCK position.

The chime stops sounding when any one of the above conditions are removed.

The headlamps on warning chime inputs are the:

- Ignition switch position
- Door ajar signal from the driver door ajar switch
- Parking lamps on/off signal from the headlamp switch

### **Turn Signal On Warning Chime**

The turn signal on warning chime warns that the turn signal has not been cancelled. The turn signal on warning chime sounds if the left or right turn signal is on and the vehicle has traveled more than 3.2 km (2.0 miles).

The turn signal on warning chime stops sounding if the turn signal is turned off, or if the ignition lock cylinder is turned to the OFF or ACC position.

The turn signal on warning chime inputs are the:

- Turn signal on signal from the multifunction switch
- Odometer count data communicated by the IC through the Medium Speed Controller Area Network (MS-CAN) communication bus

### **Door Ajar Warning Chime**

The door ajar warning chime warns that a door is not fully closed. The chime sounds when any door, or the luggage compartment lid becomes ajar while the ignition key is in the ON position.

The door ajar warning lamp/chime inputs are the:

- Ignition switch position
- Door ajar signal from the door ajar or luggage compartment lid ajar switches

**Air Bag Warning Chime**

The air bag warning chime warns that a fault is present in the Supplemental Restraint System (SRS). When a fault is present in the SRS, the Lighting Control Module (LCM) receives a request from the Restraints Control Module (RCM) and sounds the air bag warning chime. If a fault is present in the SRS when the ignition switch is placed in the ON position, the air bag warning chime sounds only 90 seconds after the key cycle.

The air bag warning chime inputs are the:

- Ignition switch position
- Air bag warning chime request signal from the RCM

**Message Center Warning Chime**

The message center warning chime sounds when a warning message is displayed on the message center. If multiple warning messages are present, a chime tone sounds for each of the warnings that are displayed.

The message center warning chime inputs are the warning messages displayed on the message center.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 419-03 for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

**NOTICE:** The electrical power to the air suspension system must be turned off prior to hoisting, jacking or towing an air suspension vehicle. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations. Failure to follow these instructions may result in personal injury.

**NOTE:** Upon installation of a new Lighting Control Module (LCM), the module must be reconfigured. Refer to Section 418-01.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Accessory drive belt</li> <li>• Brake fluid level</li> <li>• Door/decklid closures</li> <li>• Engine coolant level</li> <li>• Engine oil level</li> <li>• Fuel evaporative</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 2 (7.5A)</li> <li>◆ 13 (10A)</li> <li>◆ 26 (10A)</li> <li>◆ 31 (5A)</li> </ul> </li> <li>• Wiring, terminals or connectors</li> <li>• Message center switches</li> </ul>

system • Fuel tank • Tire pressure • Washer fluid level	• LCM • Restraints Control Module (RCM) • Instrument Cluster (IC)
--	---

3. If the cause is not visually evident, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
  - Check the scan tool connection to the VCM .
  - Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.
6. If the scan tool does not communicate with the vehicle:
    - Verify the ignition key is in the ON position.
    - Verify the scan tool operation with a known good vehicle.
    - Refer to Section 418-00 to diagnose no response from the PCM.
  7. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
    - If the network test passes, retrieve and record the continuous memory DTCs.
  8. Clear the continuous DTCs and carry out the self-test diagnostics for the IC , the RCM , LCM and the Fire Suppression System Module (FSSM).
  9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .
  10. If no DTCs related to the concern are retrieved, GO to Symptom Chart - Instrument Cluster (IC) , GO to Symptom Chart - Information And Message Center or GO to Symptom Chart - Warning Chimes .

### Instrument Cluster (IC) Self-Diagnostic Mode

To enter the IC self-diagnostic mode with the ignition key in the OFF position, press and hold the odometer/trip reset button for the base cluster or the SELECT and RESET message center switch buttons for the message center cluster. Turn the key to the RUN position and hold until the display indicates tEst (base cluster) or ENGINEERING TEST MODE (message center cluster), usually within 3 to 5 seconds. Press the odometer/trip reset button (base cluster) or the Select button (message center cluster) once to advance through each stage of the self-test. To exit the IC self-test mode, turn the ignition to the OFF position. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

**IC Self-Diagnostic Mode**

<b>Base IC Display</b>	<b>Message Center IC Display</b>	<b>Description</b>
tESt	ENGINEERING  TEST  MODE	Initial entry display into the self-test mode.
GAGE	SWEEP  ALL  GAUGES	Carries out the gauge sweep of all gauges, then displays the present gauge values.
All Vacuum Fluorescent (VF) segments illuminated	All VF segments illuminated	Carries out the prove-out of all segments in all characters simultaneously.
bulb	ALL MICRO  CONTROLLED  BULBS  ILLUMINATED	Illuminates all the micro-controlled lamps and LEDs.
PnXXXX	PART NUMBER  PREFIX xxxx  SUFFIX xx	Return to normal operation of all micro-controlled lamps/LEDs and displays the alpha-numeric prefix and suffix of the IC .
r XXXX	-	Displays the hexadecimal Read-Only Memory (ROM) level and type.
nr XXXX	MICRO  ROM LEVEL  ROM \$ xxxx  NVM \$ xxxx	Displays the hexadecimal ROM level and type as stored in the Non-Volatile Memory (NVM).
EE XX	MICRO  NVM LEVEL  \$ xx	Displays the hexadecimal EE level.
dtXXXX	MANUFACTURE  TEST DATE xxxx	Displays hexadecimal coding of the final manufacturing test date.
CF1 XX - CF3XX	MANUFACTURE  CONFIG SETTINGS xx	Displays hexadecimal of bytes 1-3 (non-message center cluster), displays hexadecimal of bytes 1-2 (message center cluster) of module configuration settings.
-	VOPS CONFIG	Displays hex coding of vehicle build options NVM module configuration settings.

	SETTINGS xxxx	
-	VEHICLE CONFIG  SETTINGS x	Displays hex coding of flexible fuel module configuration settings.  0 = non-flexible fuel  1 = flexible fuel
dtc XXXX	DTCS  xxxx	Displays a 16-bit hexadecimal format. DTCs displayed are those detected in continuous operation not during self-test.
E XXX.X	SPEEDOMETER  xxx.x MPH	Displays the imperial speed value being input in tenths of MPH to the IC , the speedometer indicates the present speed.
XXX.X	SPEEDOMETER  xxx.x km/h  xxxx DC	Displays the metric speed value being input in tenths of km/h to the IC , the speedometer indicates the present speed.
dcXXXX	xxxx DC	Displays corresponding gauge count, 0-4095.
t XXXX	TACHOMETER  xxxx RPM	Displays the tachometer value being input in RPM to the IC , tachometer indicates the present rpm.
dcXXXX	xxxx DC	Displays corresponding gauge count, 0-4095.
F1 XXX	FUEL GAUGE 1  xxx IN RA/D	Displays the present fuel pump module fuel level analog/digital input in decimal.  000-009 = short circuit, 10-254 = normal range, 255 = open circuit.  000-254 = normal range, 255 = open circuit.
F1PXXX	FUEL GAUGE 1  xxx IN FLPS	Displays the present fuel pump module fuel level analog digital input in decimal.
F2 XXX	-	Displays the present jet pump module fuel level percent ratio status in decimal.
FPXXX	FUEL GAUGE 2  xxx FLT FLPS	Displays the present filtered fuel level percent in decimal.  000-254 = normal range.  255 = open circuit for 33 seconds or longer.
-	FUEL GAUGE 2  xx.x RAFE	Displays the running average fuel economy in decimal.  xx.x = miles/gallon, --- = if input message is not received for 5 seconds or more  in = if input message is received with invalid data.
dcXXXX	xxxx DC	Displays corresponding gauge count, 0-4095.
FP XXX	-	Displays the present weighted fuel level percent status in decimal (used by the gauge).
(-) XXX C	TEMP GAUGE	Displays the last temperature gauge input value from the High Speed Controller Area Network (HS-CAN) in degrees C,



	xx DEG C	temperature gauge indicates the present temperature.  --- = if input message is not received for 5 seconds or more  in = if input message is received with invalid data.
-	TEMP GAUGE  FAIL SAFE xx	Displays the last temperature gauge input value from the HS-CAN in degrees C, temperature gauge indicates the present temperature.  fail safe cooling: \$0 = normal, \$1 = fail safe mode 1, \$2 = fail safe mode 2  0  -- = if input message is not received for 5 seconds or more.
dcXXXX	xxx DC	Displays corresponding gauge count, 0-4095.
FSC XX	FAIL SAFE xx	Displays hexadecimal value of engine coolant temp and fail safe cooling mode received from the PCM.
odoXXX	ODO ROLLING  COUNT x	Displays the odometer input received via the HS-CAN , in decimal.
oXXX.X	TRP A xxx.x  TRP B xxx.x	Displays the trip odometer value stored in Random Access Memory (RAM) in miles.
bAtXX.X	BATT xx.x V	Displays the present battery monitor reading in volts.
btXXX	COUNTS xxx	Displays the present battery analog/digital counts.  V = counts
RS -X	R/S SENSE B	RUN/START sense circuit check.  B = input is high, O = input is low
R -X	R SENSE B	RUN/ACC sense circuit check.  B = input is high, O = input is low
dC XXX	DIMMING  INPUT x	Display of the Lighting Control Module (LCM) dimming command in decimal.
dS XX	DIMMING  STEP xx	Display of the IC dimming step in decimal.
dA XX	DOOR AJAR  DRIVER x, PASSENGER x	Displays the door ajar status received from the Driver Door Module (DDM) in hexadecimal.
tA XX	TRUNK x	Displays the trunk ajar status, the driver's seat belt status and the high beam telltale input received from the LCM in hexadecimal.
-	SEAT BELT 1	Driver's seat belt status and high beam telltale input received from the LCM in hexadecimal.
-	HIGH BEAM x	Driver's seat belt status and high beam telltale input received from the LCM in hexadecimal.

tCsXXX	TC SWITCH x	Displays the present input status of the traction control on/off switch ratio in decimal.  1 = traction control system on, 0 = traction control system off
ABS XX	ABS INPUT  xx	Displays the 8-bit hexadecimal value of telltale commands received by the ABS module.  Status not received at key on or message \$4 missing for 5 seconds.
PCXXXX	PCM INPUT  xxxx	Displays the 16-bit hexadecimal value of indicator commands and fuel flow received by the PCM.  ---- = status not received at key on or message \$420 missing for 5 seconds
tr XX	HW INPUT  xx	Displays the hardwired telltale (brake fluid level status), (parking brake status) and (air suspension) status in hexadecimal.
oiXXXX	OIL PRESSURE  RA/D xxx	Displays the present ratio'd oil pressure switch analog/digital input in decimal.  820-1023 = switch open, oil pressure low  616-819 = open EOL bootloader, oil pressure low  0-615 = switch closed, oil pressure not low
-	A/D PORT 00  \$ xxx  A/D PORT 01  \$ xxx	Displays 10-bit hexadecimal value of the port AD00 A/D read (Volt Mon).  Displays 10-bit hexadecimal value of the port AD01 A/D read (Batt Mon).
-	A/D PORT 02  \$ xxx  A/D PORT 04  \$ xxx	Displays 10-bit hexadecimal value of the port AD02 A/D read (Flex Fuel).  Displays 10-bit hexadecimal value of the port AD04 A/D read (Oil Press).
-	A/D PORT 05  \$ xxx  A/D PORT 06  \$ xxx	Displays 10-bit hexadecimal value of the port AD07 A/D read (ODO Sw).  Displays 10-bit hexadecimal value of the port AD07 A/D read (ODO Sw).
-	DIG INPUTS  PORT ADL \$xx  PORT ADH \$xx	Displays 8-bit hexadecimal value of the port AD 0-7 readings.  Displays 8-bit hexadecimal value of the port AD 8-15 readings.
-		

	DIG INPUTS	Displays 8-bit hexadecimal value of the port E readings.
	PORT E \$xx	Displays 8-bit hexadecimal value of the port L readings.
	PORT L \$xx	Displays 8-bit hexadecimal value of the Port T readings.
GAGE	SWEEP	Repeats the test display cycle.
	ALL	
	GAUGES	

## DTC Charts

### Instrument Cluster (IC) DTC Chart

DTC	Description	Action
B1202	Fuel Sender Circuit Open	<u>GO to Pinpoint Test B</u> .
B1204	Fuel Sender Circuit Short to Ground	<u>GO to Pinpoint Test B</u> .
B1205	EIC Switch-1 Assembly Circuit Failure	<u>GO to Pinpoint Test AD</u> .
B1206	EIC Switch-1 Assembly Circuit Open	<u>GO to Pinpoint Test AD</u> .
B1208	EIC Switch-1 Assembly Circuit Short To Ground	<u>GO to Pinpoint Test AD</u> .
B1209	EIC Switch-2 Assembly Circuit Failure	<u>GO to Pinpoint Test AD</u> .
B1210	EIC Switch-2 Assembly Circuit Open	<u>GO to Pinpoint Test AD</u> .
B1212	EIC Switch-2 Assembly Circuit Short To Ground	<u>GO to Pinpoint Test AD</u> .
B1317	Battery Voltage High	<u>GO to Pinpoint Test AN</u> .
B1318	Battery Voltage Low	<u>GO to Pinpoint Test AO</u> .
B1342	ECU is Faulted	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is still present, INSTALL a new Instrument Cluster (IC). REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.
B2143	NVM Memory Failure	CLEAR the DTCs. REPEAT the self-test. If DTC B2143 is still present, INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.
B2477	Module Configuration Failure	CARRY OUT the Programmable Module Installation (PMI) to configure the IC . CLEAR the DTCs. REPEAT the self-test. If DTC B2477 is still present, INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section.

B2675	Trip Reset Button Stuck	CHECK the assembly of the IC lens for binding or sticking. If the lens is installed correctly, INSTALL a new IC . REFER to <u>Instrument Cluster (IC) Lens</u> in this section. If the lens is not installed correctly, REPAIR or INSTALL a new lens. REFER to <u>Instrument Cluster (IC)</u> in this section. CLEAR the DTCs. REPEAT the self-test.
U1262	SCP (J1850) Communication Bus Fault	REPAIR all other DTCs first. CLEAR the DTCs. CYCLE the key OFF then ON and wait 10 seconds. REPEAT the self-test.  If DTC U1262 is still present, REFER to <u>Section 418-00</u> .
U1900	CAN Communication Bus Fault - Receive Error	REPAIR all other DTCs first. CLEAR the DTCs. CYCLE the key OFF then ON and wait 10 seconds. REPEAT the self-test.  If DTC U1900 is still present, REFER to <u>Section 418-00</u> .
U2023	Fault Received From External Node	U2023 is set when a module receives invalid network data from another module with a faulted input. RETRIEVE and REPAIR all non-network DTCs in the PCM and other modules on the network. REFER to <u>Section 419-10</u> for a list of all DTCs.
U2050	No Application Present	REPROGRAM the IC . If the DTC occurs after a software reprogram, REPROGRAM the IC again.  If the DTC reappears after each attempt to reprogram, INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.

**Fire Suppression System Module (FSSM) DTC Chart**

DTC	Description	Action
B1921	Air Bag Diagnostic Monitor Ground Circuit Open	<u>GO to Pinpoint Test M</u> .
B29B3	Fire Suppression Indicator Lamp Circuit Failure	If the indicator is never on, <u>GO to Pinpoint Test L</u> .  If the indicator is always on, <u>GO to Pinpoint Test M</u> .
B29B4	Fire Suppression Indicator Lamp Circuit Short to Battery	<u>GO to Pinpoint Test M</u> .
All other DTCs	-	REFER to <u>Section 419-03</u> .

**Lighting Control Module (LCM) DTC Chart**

DTC	Description Source	Action
DTC B1334	Decklid Ajar Rear Door Circuit Short to Ground	<u>GO to Pinpoint Test AG</u> .

B1352	Ignition Key-In Circuit Failure	<u>GO to Pinpoint Test AJ</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

**PCM DTC Chart**

DTC	Description	Action
P0457	Evaporative Emission System Leak Detected (Fuel Cap Loose/Off)	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
P0460	Fuel Level Sensor A Circuit	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual first.  If sent here from the PC/ED manual, <u>GO to Pinpoint Test B</u> .
P0461	Fuel Level Sensor A Circuit Range/Performance	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual first.  If sent here from the PC/ED manual, <u>GO to Pinpoint Test B</u> .
P0462	Fuel Level Sensor A Circuit Low	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual first.  If sent here from the PC/ED manual, <u>GO to Pinpoint Test B</u> .
P0463	Fuel Level Sensor A Circuit High	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual first.  If sent here from the PC/ED manual, <u>GO to Pinpoint Test B</u> .
All other DTCs	-	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

**Restraints Control Module (RCM) DTC Chart**

DTC	Description	Action
B1869	Lamp Air Bag Warning Indicator Circuit Open	<u>GO to Pinpoint Test U</u> .
B1870	Lamp Air Bag Warning Indicator Circuit Short To Battery	<u>GO to Pinpoint Test U</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

**Symptom Charts**

Symptom Chart - Instrument Cluster (IC)

Symptom Chart - Information And Message Center

Symptom Chart - Warning Chimes

## Pinpoint Tests

### Pinpoint Test A: The Instrument Cluster (IC) Is Inoperative

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

#### Normal Operation

With the ignition switch in the RUN, START or OFF position, the Instrument Cluster (IC) receives voltage from the Central Junction Box (CJB). The IC grounding is through two independent circuits.

**This pinpoint test is intended to diagnose the following:**

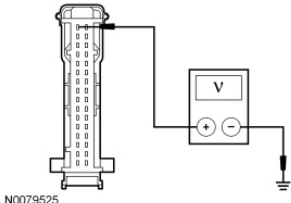
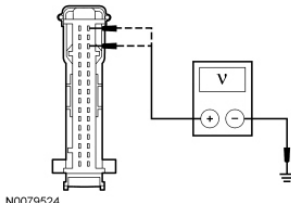
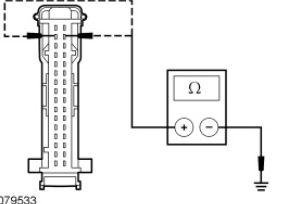
- Fuse(s)
- Wiring, terminals or connectors
- IC

#### PINPOINT TEST A: THE IC IS INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>A1 CHECK THE B+ KEEP ALIVE CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the voltage between the IC , C2220-1, circuit 1523 (DG), harness side and ground</li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> VERIFY the CJB fuse 2 (7.5A) is OK. If OK, REPAIR the circuit for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes for the circuit short.</p>

 <p>N0079525</p> <p>• Is the voltage greater than 10 volts?</p>	
<p><b>A2 CHECK THE IC RUN/START VOLTAGE SUPPLY</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the IC , C2220-17, circuit 1003 (GY/YE), harness side and ground; and between the IC , C2220-19, circuit 640 (RD/YE), harness side and ground.</li> </ul>  <p>N0079524</p> <p>• Are the voltages greater than 10 volts?</p>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> VERIFY the CJB fuses 13 (10A) and 26 (10A) are OK. If OK, REPAIR the circuit for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes for the circuit short.</p>
<p><b>A3 CHECK IC GROUND CIRCUITS</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable .</li> <li>• Measure the resistance between the IC , C2220-2, circuit 676 (PK/OG), harness side and ground; and between the IC , C2220-18, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0079533</p> <p>• Are the resistances less than 5 ohms?</p>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> REPAIR the circuit in question. TEST the system for normal operation.</p>
<p><b>A4 CHECK FOR CORRECT IC OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time.</p>

<ul style="list-style-type: none"> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	The concern may have been caused by a loose or corroded connector.
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## Pinpoint Test B: Incorrect Fuel Gauge Indication

Refer to Wiring Diagrams Cell [60](#) , Instrument Cluster for schematic and connector information.

### Normal Operation

The fuel pump module receives a reference voltage signal from the Instrument Cluster (IC) through a signal circuit and grounds through a separate return circuit. The fuel level is determined using a variable resistance fuel sensor (float and card), with an approximate resistance range between 15 ohms  $\pm$  2 ohms at empty (E) and 160 ohms  $\pm$  4 ohms at full (F). The IC interprets the voltage change as the resistance changes in the fuel level sensor and commands the fuel gauge to sweep to the correct level.

Flex fuel vehicles use AC for the sending unit, which is then converted by the IC to DC. The direction of the current through the fuel level sensor is switched by the cluster at a rate of 50 Hz with 50% of the duty cycle in each direction. The IC senses the variable resistance of the fuel level sensor by supplying voltage across the pins of the fuel pump module. This voltage varies based upon the value of the fuel level sensor resistance, which is determined by the level of the fuel sensor float and the battery voltage.

The IC uses 4 different operating modes to calculate the fuel level:

- Anti-slosh (default mode)
- Key OFF fueling
- Key ON fueling
- Recovery

After a fuel fill up, the time for the fuel gauge to move from empty (E) to full (F) ranges from 2 seconds to 55 minutes depending on which operating mode the fuel gauge is in.

The default fuel gauge mode is called the anti-slosh mode. To prevent fuel gauge changes from fuel slosh (gauge instability due to changes in fuel sender readings caused by fuel moving around in the tank), the fuel gauge takes approximately 55 minutes to go from empty (E) to full (F).

The key OFF fueling mode (2 seconds to read empty [E] to full [F]) requires 3 conditions be met:

- The key must be in the OFF position throughout the entire refueling of the vehicle.
- At least 15% of the vehicle's fuel capacity must be added to the fuel tank.
- The IC must receive a valid key ON fuel sender reading within 1 second of the key being put into the RUN position. The key ON sample readings are considered valid if the fuel sender reading is between 15 ohms ( $\pm$  2 ohms) and 160 ohms ( $\pm$  4 ohms).

If these conditions are not met, the fuel gauge stays in the anti-slosh mode, which results in a slow to read full (F) event.

The key ON fueling mode (approximately 90 seconds to read empty [E] to full [F]) requires 3 conditions be met:

- The transmission is in PARK (P).



- The key is in the RUN position.
- At least 15% of the vehicle's fuel capacity must be added to the fuel tank.

In key ON fueling mode, a 30-second timer activates after the transmission is put into the PARK (P) position. When the 30-second time has elapsed and at least 15% of the vehicle's fuel capacity has been added, the fuel gauge response time is 90 seconds to read from empty (E) to full (F). When the transmission is shifted out of PARK (P), the fuel gauge strategy reverts to the anti-slosh mode. The key on refueling mode prevents slow to read full events from happening if the customer refuels the vehicle with the key in the RUN position.

Recovery mode is incorporated into the IC strategy to recover from a missing fuel level input during a refueling event. Missing fuel level inputs result from intermittent opens in the fuel sender or its circuits. Recovery mode (empty [E] to full [F] in approximately 20 minutes) is initiated when the following 2 conditions are met:

- The IC is in the anti-slosh (default) mode.
- The actual fuel level in the tank is greater than what is being displayed by the fuel gauge.

### Instrument Cluster (IC) DTCs

DTC Description	Fault Trigger Conditions
<ul style="list-style-type: none"> <li>• B1202 - Fuel Sender Circuit Open</li> </ul>	A continuous and on-demand DTC that sets if the IC detects an open or short to voltage for 33 seconds on the fuel level input circuit.
<ul style="list-style-type: none"> <li>• B1204 - Fuel Sender Circuit Short To Ground</li> </ul>	A continuous and on-demand DTC that sets if the IC detects a short to ground for 33 seconds on the fuel level input circuit.

### PCM DTCs

DTC Description	Fault Trigger Conditions
<ul style="list-style-type: none"> <li>• P0460 - Fuel Level Sensor A Circuit</li> </ul>	Sets when the PCM determines the value of the fuel level input signal is stuck, that the fuel level input signal does not change or does not correspond with the calculated fuel usage.
<ul style="list-style-type: none"> <li>• P0461 - Fuel Level Sensor A Circuit Range/Performance</li> </ul>	Sets when the PCM determines the fuel level input signal repeatedly moves in and out of range, exceeding the minimum or maximum allowable calibrated parameters for a specified fuel fill percentage in the fuel tank.
<ul style="list-style-type: none"> <li>• P0462 - Fuel Level Sensor A Circuit Low</li> </ul>	Sets in the PCM when the PCM detects a short to ground on the fuel pump module signal circuit based on the messaged input received from the IC .
<ul style="list-style-type: none"> <li>• P0463 - Fuel Level Sensor A Circuit High</li> </ul>	Sets in the PCM when the PCM detects an open or a short to voltage on the fuel pump module signal circuit based on the messaged input received from the IC .

**This pinpoint test is intended to diagnose the following:**

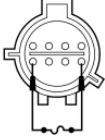
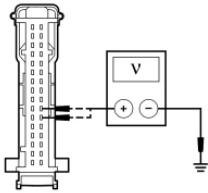
- Wiring, terminals or connectors
- Fuel pump module
- Fuel level sensor (float and card)
- Fuel tank
- IC

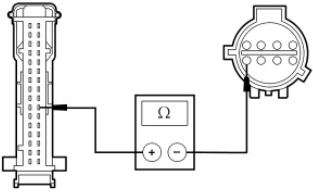
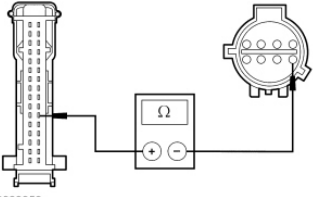
**PINPOINT TEST B: INCORRECT FUEL GAUGE INDICATION**

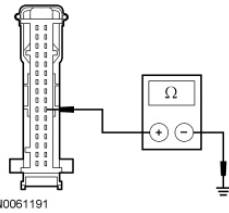
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** The electrical power to the air suspension system must be turned off prior to hoisting, jacking or towing an air suspension vehicle. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations. Failure to follow these instructions may result in personal injury.

Test Step	Result / Action to Take
<b>B1 RETRIEVE THE RECORDED DTCs FROM THE IC SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded IC DTCs from the self-test.</li> <li>• <b>Are any IC DTCs recorded?</b></li> </ul>	<p><b>Yes</b> If DTC B1202 is retrieved, GO to <b>B3</b> .</p> <p>If DTC B1204 is retrieved, GO to <b>B7</b> .</p> <p>For all other IC DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <b>B2</b> .</p>
<b>B2 CARRY OUT THE IC FUEL GAUGE INDICATOR CONTROL ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC fuel gauge (FUEL) active command and command the fuel gauge to 20%, 50%, 70% and 100%.</li> <li>• <b>Does the fuel gauge start at E (empty) and move to 1/4, 1/2, 3/4 and F (full)?</b></li> </ul>	<p><b>Yes</b> GO to <b>B10</b> .</p> <p><b>No</b> GO to <b>B13</b> .</p>
<b>B3 CHECK THE FUEL PUMP MODULE FOR AN OPEN</b>	
<p><b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <b>Section 419-03</b> . Failure to follow the instructions may result in serious personal injury.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Fuel Pump Module C433 .</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <b>B12</b> .</p> <p><b>No</b> REMOVE the jumper wire. GO to <b>B4</b> .</p>

<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the fuel pump module C433-5, circuit 29 (YE/WH), harness side and the fuel pump module C433-8, circuit 1843 (BK/OG), harness side.</li> </ul>  <p>N0053209</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Wait one minute.</li> <li>• Enter the following diagnostic mode on the scan tool: IC Self-Test .</li> <li>• <b>NOTE:</b> DTC B1202 may also be present when carrying out this step and should be ignored.</li> <li>• Clear the IC DTCs. Repeat the IC self-test.</li> <li>• <b>Is DTC B1204 retrieved?</b></li> </ul>	
<b>B4 CHECK THE INPUT AND RETURN CIRCUITS FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the IC C2220-26, circuit 29 (YE/WH), harness side and ground; and between the IC C2220-27, circuit 1843 (BK/OG), harness side and ground.</li> </ul>  <p>N0060225</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <b>B14</b> .</p> <p><b>No</b> GO to <b>B5</b> .</p>
<b>B5 CHECK THE INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the IC C2220-26, circuit 29 (YE/WH), harness side and the fuel pump module C433-5, circuit 29 (YE/WH), harness side.</li> </ul>	<p><b>Yes</b> GO to <b>B6</b> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <b>B14</b> .</p>

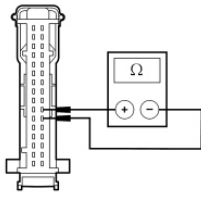
 <p>N0068913</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>B6 CHECK THE RETURN CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the IC C2220-27, circuit 1843 (BK/OG), harness side and the fuel pump module C433-8, circuit 1843 (BK/OG), harness side.</li> </ul>  <p>N0069059</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>B13</u> .</p> <p><b>No</b> REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <u>B14</u> .</p>
<b>B7 CHECK THE FUEL PUMP MODULE FOR A SHORT TO GROUND</b>	
<p><b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 419-03</u> . Failure to follow the instructions may result in serious personal injury.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Fuel Pump Module C433 .</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC Self-Test .</li> <li>• Wait one minute.</li> <li>• <b>NOTE:</b> DTC B1204 may also be present when carrying out this step and should be ignored.</li> <li>• Clear the IC DTCs. Repeat the IC self-test.</li> <li>• Is DTC B1202 retrieved?</li> </ul>	<p><b>Yes</b> GO to <u>B12</u> .</p> <p><b>No</b> GO to <u>B8</u> .</p>
<b>B8 CHECK THE INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-26, circuit 29 (YE/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>B9</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <u>B14</u> .</p>



- Is the resistance greater than 10,000 ohms?

### B9 CHECK INPUT AND RETURN CIRCUITS FOR A SHORT TOGETHER

- Measure the resistance between the IC C2220-26, circuit 29 (YE/WH), harness side and the IC C2220-27, circuit 1843 (BK/OG), harness side.



- Is the resistance greater than 10,000 ohms?

**Yes**  
GO to B13 .

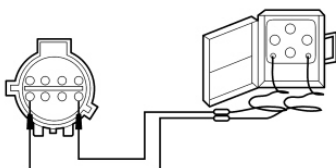
**No**  
REPAIR the circuits. CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to B14 .

### B10 CHECK THE FUEL LEVEL INPUT TO THE IC

**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 419-03 . Failure to follow the instructions may result in serious personal injury.

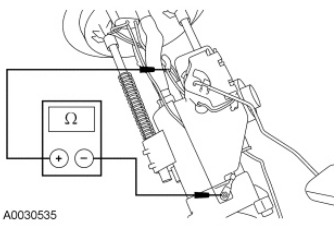
**NOTE:** Since the IC may be in anti-slosh fuel indication mode, the PID values may not match the fuel gauge readings. The actual gauge indication should be disregarded during this test step.

- Ignition OFF.
- Disconnect: Fuel Pump Module C433 .
- Connect one lead of the instrument gauge system tester to the fuel pump module assembly C433-8, circuit 1843 (BK/OG), harness side. Connect the other lead to the fuel pump module assembly C433-5, circuit 29 (YE/WH), harness side.



**Yes**  
GO to B11 .

**No**  
GO to B13 .

<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• <b>NOTE:</b> It is extremely important to confirm the gauge tester settings with an ohmmeter to ensure that the gauge tester is in the correct position. Failure to follow this check may result in inaccurate test results.</li> <li>• Monitor the IC fuel level (FUELLVL1) PID with the gauge tester set at 15 ohms, 53 ohms, 85 ohms, 115 ohms and 160 ohms.</li> <li>• <b>Does the PID begin at approximately 0%, move to 25%, 50%, 75%, then 100%?</b></li> </ul>	
<b>B11 CHECK THE FUEL TANK</b>	
<ul style="list-style-type: none"> <li>• Check the fuel tank for any damage or deformation.</li> <li>• <b>Is the fuel tank OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>B12</u> .</p> <p><b>No</b> VERIFY the fuel pump module, fuel level sensor and float arm are OK. INSTALL a new fuel tank. REFER to <u>Section 310-01</u> . TEST the system for normal operation. If equipped with the fire suppression system, GO to <u>B14</u> .</p>
<b>B12 CHECK THE FUEL LEVEL SENSOR</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> The fuel level sensor resistance will measure between 15 ohms <math>\pm</math> 2 ohms at the lower stop position and 160 ohms <math>\pm</math> 4 ohms at the upper stop position.</li> <li>• Remove the fuel pump module. Refer to <u>Section 310-01</u> .</li> <li>• <b>NOTE:</b> Disconnect the fuel level sensor input wire from the fuel pump module for this measurement.</li> <li>• Measure the resistance between the fuel level sensor card input wire and the fuel level sensor ground while slowly moving the float between the lower stop and the upper stop position.</li> </ul>  <p>A0030535</p> <ul style="list-style-type: none"> <li>• <b>Does the resistance slowly increase from approximately 15 ohms to 160 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new fuel pump module. REFER to <u>Section 310-01</u> . CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <u>B14</u> .</p> <p><b>No</b> INSTALL a new fuel level sensor (float and card). CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <u>B14</u> .</p>
<b>B13 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for</p>

<ul style="list-style-type: none"> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p>normal operation. If equipped with the fire suppression system, GO to <b>B14</b> .</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test. If equipped with the fire suppression system, GO to <b>B14</b> .</p>
<b>B14 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<p><b>⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 419-03</u> . Failure to follow these instructions may result in serious personal injury.</b></p> <ul style="list-style-type: none"> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 419-03</u> .</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> The fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 419-03</u> for the fire suppression system depowering and repowering procedure.</p>

### Pinpoint Test C: The Temperature Gauge Is Inoperative

#### Normal Operation

The PCM receives the engine coolant temperature status through hardwired circuitry from the Cylinder Head Temperature (CHT) sensor. The Instrument Cluster (IC) receives the engine coolant temperature data from the PCM over the High Speed Controller Area Network (HS-CAN). The IC monitors the engine coolant temperature data received from the PCM and commands the engine coolant temperature gauge pointer.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

#### PINPOINT TEST C: THE TEMPERATURE GAUGE IS INOPERATIVE

Test Step	Result / Action to Take
<b>C1 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the KOEO self-test.</li> <li>• <b>Are any PCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <b>C2</b> .</p>

<b>C2 CARRY OUT THE IC COOLANT TEMPERATURE GAUGE ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC coolant temperature gauge (ENGCOOLNT) active command and command the coolant temperature gauge to 25%, 75%, 100% and 125%.</li> <li>• <b>Does the temperature gauge start at C (cold), move to approximately 1/4, 1/2, then H (hot)?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test D: The Tachometer Is Inoperative****Normal Operation**

The tachometer is electrically operated and indicates the engine speed in rpm. The tachometer range is 0 to 7,000 rpm. The PCM uses the Crankshaft Position (CKP) sensor to measure the engine rpm and sends the data to the Instrument Cluster (IC), over the High Speed Controller Area Network (HS-CAN), to command the tachometer gauge. If the rpm information sent to the IC is invalid or missing, the IC defaults the tachometer to 0 rpm.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

**PINPOINT TEST D: THE TACHOMETER IS INOPERATIVE**

<b>Test Step</b>	<b>Result / Action to Take</b>
<b>D1 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the KOEO self-test.</li> <li>• <b>Are any PCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>D2</u> .</p>
<b>D2 CARRY OUT THE IC TACHOMETER ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC tachometer (TACH) active command and command the tachometer to 1,400, 2,800, 4,200, 5,600, and 7,000 rpm.</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>



- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Does the tachometer gauge move to the commanded rpms?</li> </ul> |  |
|---|--|

**Pinpoint Test E: The Speedometer Is Inoperative****Normal Operation**

The PCM calculates vehicle speed from the transmission Output Shaft Speed (OSS) sensor input and from the tire size and axle ratio configuration in the Vehicle Identification (VID) block of the PCM. The PCM provides the Instrument Cluster (IC) with the Vehicle Speed Sensor (VSS) signal over the High Speed Controller Area Network (HS-CAN) communication bus. The IC monitors the VSS input from the PCM and commands the speedometer with a corresponding movement of the pointer.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

**PINPOINT TEST E: THE SPEEDOMETER IS INOPERATIVE**

Test Step	Result / Action to Take
<b>E1 CARRY OUT THE IC SPEEDOMETER ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC speedometer (SPDOMETER) active command and command the speedometer to 0, 193 km/h (120 mph), and back to 0.</li> <li>• <b>Does the speedometer reading start at 0 and move to 193 km/h (120 mph), and return to 0?</b></li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
<b>E2 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the KOEO self-test.</li> <li>• <b>Are any PCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>E3</u> .</p>
<b>E3 RETRIEVE THE RECORDED DTCs FROM THE IC SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded DTCs from the IC self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> For DTC U1900, REPAIR all other DTCs first. CLEAR the DTCs. CYCLE the key OFF then ON and wait 10 seconds. REPEAT the self-test.</p>

	<p>If DTC U1900 is still present, REFER to <a href="#">Section 418-00</a> .</p> <p>For DTC U2023, RETRIEVE and REPAIR all non-network DTCs in the PCM and other modules on the network. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>For all other DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b> INSTALL a new PCM. REFER to <a href="#">Section 303-14</a> . TEST the system for normal operation.</p>
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### Pinpoint Test F: The Low Fuel Warning Indicator Is Never/Always On

#### Normal Operation

The low fuel warning indicator is illuminated when the fuel level reaches a predetermined level of approximately 1/8 tank. The low fuel warning indicator and the fuel gauge are controlled by the Instrument Cluster (IC) based upon the fuel level data provided by the fuel pump gauge sender. When the IC receives the data, the fuel gauge indicates low fuel and the IC illuminates the low fuel warning indicator.

**This pinpoint test is intended to diagnose the following:**

- IC

#### PINPOINT TEST F: THE LOW FUEL WARNING INDICATOR IS NEVER/ALWAYS ON

Test Step	Result / Action to Take
<b>F1 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC all lamps (ALL_LAMP) active command on and off. Observe the low fuel warning indicator.</li> <li>• <b>Does the low fuel warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">F2</a> .</p> <p><b>No</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section. TEST the system for normal operation.</p>
<b>F2 CHECK THE FUEL GAUGE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Check the fuel gauge operation.</li> <li>• <b>Does the fuel gauge operate correctly?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section. TEST the system for normal operation.</p> <p><b>No</b></p>

**Pinpoint Test G: The Safety Belt Warning Indicator Is Inoperative (Chime Is Operative)/Does Not Operate Correctly****Normal Operation**

The safety belt switch is hardwired to the Restraints Control Module (RCM). The RCM sends a signal on the input circuit to the Lighting Control Module (LCM) when the safety belt is fastened or unfastened, communicating the safety belt switch status. The LCM sends the safety belt switch status to the Instrument Cluster (IC) over the Standard Corporate Protocol (SCP) communication network to illuminate the safety belt warning indicator.

**This pinpoint test is intended to diagnose the following:**

- LCM
- IC

**PINPOINT TEST G: THE SAFETY BELT WARNING INDICATOR IS INOPERATIVE (CHIME IS OPERATIVE)/DOES NOT OPERATE CORRECTLY**

Test Step	Result / Action to Take
<b>G1 CHECK THE SAFETY BELT CHIME OPERATION</b>	
<ul style="list-style-type: none"> <li>• Check the operation of the safety belt chime for correct operation.</li> <li>• <b>Does the safety belt chime operate correctly?</b></li> </ul>	<b>Yes</b> GO to <u>G2</u> .  <b>No</b> GO to Pinpoint Test <u>AI</u> .
<b>G2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC safety belt warning indicator (SBLT_LAMP) active command on and off. Observe the safety belt warning indicator.</li> <li>• <b>Does the safety belt warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.  <b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.

**Pinpoint Test H: The Check Fuel Cap Warning Indicator Is Never/Always On****Normal Operation**

The PCM monitors the fuel tank evaporative emission system for significant leaks that occur following refueling of the vehicle. Once the PCM detects a fuel vapor leak, the PCM sends the Instrument Cluster (IC) a message over the communication network to turn on the check fuel cap warning indicator. The PCM only sets DTC P0457 following a successful cruise test, which is initiated when the vehicle is driven at a steady speed

above 64 km/h (40 mph) for a duration of approximately 4-5 minutes. If the PCM is unable to successfully run the cruise test, the IC does not receive the fuel cap status and the check fuel cap warning indicator remains off.

- DTC P0457 (Evaporative Emission System Leak Detected) (Fuel Cap Loose/Off) - sets in the PCM if a fuel tank pressure change greater than -23.7 kPa (-7 in-Hg) of vacuum within 30 seconds after refueling occurs, or there is an excessive purge (fuel vapor) flow of greater than 454 g (1.0 lb) per minute.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

**PINPOINT TEST H: THE CHECK FUEL CAP WARNING INDICATOR IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>H1 CARRY OUT THE IC INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC all warning lamps (ALL_LAMP) active command on and off. Observe the check fuel cap indicator.</li> <li>• <b>Does the check fuel cap indicator illuminate when commanded on and turn off when commanded off?</b></li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
<b>H2 RETRIEVE THE RECORDED DTCs FROM PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li>• <b>Is DTC P0457 recorded?</b></li> </ul>	<p><b>Yes</b> If the check fuel cap indicator is illuminated, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>If the check fuel cap indicator is not illuminated, INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> If the check fuel cap indicator is always on, INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p>If the check fuel cap indicator is not illuminated, the system</p>

is operating normally at this time. If the fuel cap was left off and the check fuel cap warning indicator did not turn on, driving conditions may not have allowed for the PCM to run the cruise test and message the IC to turn on the check fuel cap warning indicator.
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**Pinpoint Test I: The BRAKE Warning Indicator Is Never On**

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

**Normal Operation**

When the parking brake is applied, the parking brake input circuit is grounded through the parking brake switch and the separate parking brake ground circuit. The parking brake applied ground is supplied to the Instrument Cluster (IC) through the brake fluid level switch and the brake warning indicator input circuit. The IC receives the ground signal and illuminates the BRAKE warning indicator.

When the brake fluid level is low, the brake warning indicator input circuit to the IC is grounded through the brake fluid level switch. The IC receives the ground signal and illuminates the BRAKE warning indicator.

When a base brake system concern occurs, the ABS module sends a signal to the IC over the communication network to illuminate the BRAKE warning indicator. If communication between the IC and the ABS module is lost, the IC turns on the BRAKE warning indicator.

**This pinpoint test is intended to diagnose the following:**

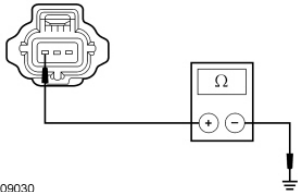
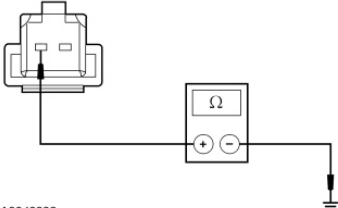
- Wiring, terminals or connectors
- Parking brake switch
- Brake fluid level switch (part of the brake fluid reservoir)
- IC

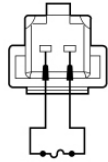
**PINPOINT TEST I: THE BRAKE WARNING INDICATOR IS NEVER ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result if false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>I1 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC brake warning indicator (BRK_LAMP) active command on and off. Observe the BRAKE warning indicator.</li> <li>• <b>Does the BRAKE warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> GO to <u>I2</u> .</p> <p><b>No</b> GO to <u>I9</u> .</p>

<b>I2 CHECK THE PARKING BRAKE SWITCH INPUT</b>	
<ul style="list-style-type: none"> <li>• Apply the parking brake.</li> <li>• <b>Does the BRAKE warning indicator illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>I3</u> .</p> <p><b>No</b> GO to <u>I4</u> .</p>
<b>I3 CHECK THE BRAKE FLUID LEVEL SWITCH GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable .</li> <li>• Disconnect: Brake Fluid Level Switch C124 .</li> <li>• Measure the resistance between the brake fluid level switch C124-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0009030</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> INSTALL a new brake fluid reservoir. REFER to <u>Section 206-06</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>I4 CHECK THE PARKING BRAKE SWITCH GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable .</li> <li>• Disconnect: Parking Brake Switch C2015 .</li> <li>• Measure the resistance between the parking brake switch C2015-1, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0049232</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>I5</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>I5 BYPASS THE PARKING BRAKE SWITCH</b>	
<ul style="list-style-type: none"> <li>• Connect: Negative Battery Cable .</li> <li>• Connect a fused jumper wire between the parking brake switch C2015-2, circuit 409 (TN/BK), harness side and the parking brake switch C2015-1, circuit 57 (BK), harness side.</li> </ul>	<p><b>Yes</b> INSTALL a new parking brake switch. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>I6</u> .</p>

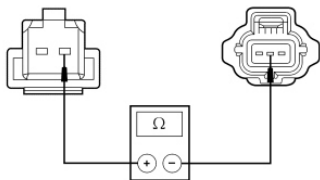


N0027214

- Ignition ON.
- Does the BRAKE warning indicator illuminate?

# **I6 CHECK THE PARKING BRAKE INPUT CIRCUIT BETWEEN THE PARKING BRAKE SWITCH AND THE BRAKE FLUID LEVEL SWITCH FOR AN OPEN**

- Ignition OFF.
- Disconnect: Brake Fluid Level Switch C124 .
- Measure the resistance between the parking brake switch C2015-2, circuit 409 (TN/BK), harness side and the brake fluid level switch C124-2, circuit 409 (TN/BK), harness side.



N0053631

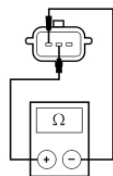
- Is the resistance less than 5 ohms?

**Yes**GO to I7 .**No**

REPAIR the circuit. TEST the system for normal operation.

# **I7 CHECK THE BRAKE FLUID LEVEL SWITCH**

- Measure the resistance between the brake fluid level switch, pin 2, component side and the brake fluid level switch, pin 3, component side.



N0068915

- Is the resistance less than 5 ohms?

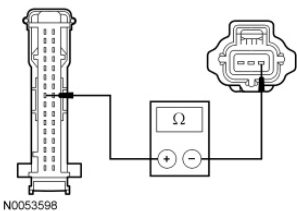
**Yes**GO to I8 .**No**INSTALL a new brake fluid reservoir. REFER to Section 206-06 . TEST the system for normal operation.

# **I8 CHECK THE BRAKE WARNING INDICATOR INPUT CIRCUIT FOR AN OPEN**

- Disconnect: IC C2220 .
- Measure the resistance between the IC C2220-8, circuit 977 (VT/WH), harness side and the brake fluid level switch C124-3, circuit 977 (VT/WH) harness side.

**Yes**GO to I9 .**No**

REPAIR the circuit. TEST the system for normal operation.

 <p>• Is the resistance less than 5 ohms?</p>	
<b>I9 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test J: The BRAKE Warning Indicator Is Always On

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

#### Normal Operation

When the parking brake is applied, the parking brake input circuit is grounded through the parking brake switch and the separate parking brake ground circuit. The parking brake applied ground is supplied to the Instrument Cluster (IC) through the brake fluid level switch and the brake warning indicator input circuit. The IC receives the ground signal and illuminates the BRAKE warning indicator.

When the brake fluid level is low, the brake warning indicator input circuit to the IC is grounded through the brake fluid level switch. The IC receives the ground signal and illuminates the BRAKE warning indicator.

When a base brake system concern occurs, the ABS module sends a signal to the IC over the communication network to illuminate the BRAKE warning indicator. If communication between the IC and the ABS module is lost, the IC turns on the BRAKE warning indicator.

#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Parking brake switch
- Brake fluid level switch (part of the brake fluid reservoir)
- ABS module
- IC

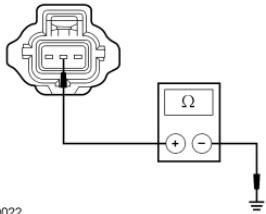
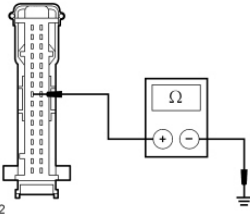


**PINPOINT TEST J: THE BRAKE WARNING INDICATOR IS ALWAYS ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Verify that the parking brake is fully released and the brake fluid level is full before proceeding with this pinpoint test.

Test Step	Result / Action to Take
<b>J1 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC brake warning indicator (BRK_LAMP) active command on and off. Observe the BRAKE warning indicator.</li> <li>• <b>Does the BRAKE warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> GO to <u>J2</u> .</p> <p><b>No</b> GO to <u>J7</u> .</p>
<b>J2 CHECK THE PARKING BRAKE SWITCH INPUT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Parking Brake Switch C2015 .</li> <li>• Ignition ON.</li> <li>• Monitor the BRAKE warning indicator.</li> <li>• <b>Does the BRAKE warning indicator turn off?</b></li> </ul>	<p><b>Yes</b> INSTALL a new parking brake switch. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>J3</u> .</p>
<b>J3 CHECK THE BRAKE FLUID LEVEL SWITCH INPUT</b>	
<p><b>NOTE:</b> Verify that the brake fluid reservoir is full before proceeding with diagnosis of the brake fluid level switch.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Brake Fluid Level Switch C124 .</li> <li>• Ignition ON.</li> <li>• Monitor the BRAKE warning indicator.</li> <li>• <b>Does the BRAKE warning indicator turn off?</b></li> </ul>	<p><b>Yes</b> GO to <u>J4</u> .</p> <p><b>No</b> GO to <u>J5</u> .</p>
<b>J4 CHECK THE PARKING BRAKE INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the brake fluid level switch C124-2, circuit 409 (TN/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new brake fluid reservoir. REFER to <u>Section 206-06</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

 <p>N0009022</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>J5 CHECK THE BRAKE WARNING INDICATOR INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-8, circuit 977 (VT/WH), harness side and ground.</li> </ul>  <p>N0027212</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>J6</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>J6 MONITOR THE IC ABS MODULE MESSAGE</b>	
<ul style="list-style-type: none"> <li>• Connect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Monitor the IC ABS input (ABS_MSG) PID for a missing CAN message.</li> <li>• Does the PID display Yes?</li> </ul>	<p><b>Yes</b> VERIFY that the scan tool can communicate with the ABS module.</p> <p>If the scan tool cannot establish communication with the ABS module, REFER to <u>Section 418-00</u> .</p> <p>If the scan tool does communicate with the ABS module, GO to <u>J7</u> .</p> <p><b>No</b> GO to <u>J8</u> .</p>
<b>J7 CHECK FOR CORRECT ABS MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the ABS module connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the ABS module connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Section 206-09</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>J8 CHECK FOR CORRECT IC OPERATION</b>	

<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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### Pinpoint Test K: The Charging System Warning Indicator Is Never/Always On

#### Normal Operation

The Instrument Cluster (IC) receives the charging system status from the PCM over the High Speed Controller Area Network (HS-CAN). Charging system data is monitored by the IC and when the charging system voltage is low, illuminates the charging system warning indicator.

**This pinpoint test is intended to diagnose the following:**

- Charging system
- PCM
- IC

#### PINPOINT TEST K: THE CHARGING SYSTEM WARNING INDICATOR IS NEVER/ALWAYS ON

Test Step	Result / Action to Take
<b>K1 CARRY OUT THE IC INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC charging system warning indicator (CHARGE_LMP) active command. Command the charging system warning indicator on and off. Observe the charging system warning indicator.</li> <li>• <b>Does the charging system warning indicator illuminate when commanded on and turn off when commanded off?</b></li> </ul>	<p><b>Yes</b> GO to <u>K2</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
<b>K2 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li>• <b>Are any charging system DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 414-00</u> .</p> <p><b>No</b> GO to <u>K3</u> .</p>
<b>K3 CHECK THE CHARGING SYSTEM OPERATION</b>	

<ul style="list-style-type: none"> <li>• Check the charging system operation. Refer to <a href="#">Section 414-00</a> .</li> <li>• <b>Does the charging system operate correctly?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <a href="#">Section 303-14</a> . TEST the system for normal operation.</p> <p><b>No</b> REFER to <a href="#">Section 414-00</a> .</p>
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**Pinpoint Test L: The Fire Suppression System Indicator Is Never On (Police Vehicles Only)**

Refer to Wiring Diagrams Cell [60](#) , Instrument Cluster for schematic and connector information.

**Normal Operation**

If the Fire Suppression System Module (FSSM) detects a concern with any of the fire suppression system components, the fire suppression indicator illuminates and a DTC is logged.

The FSSM is hardwired to the IC through a single input circuit and is grounded through the FSSM ground circuit. If a fault occurs in the fire suppression system, a DTC is set and the FSSM removes the ground on the input circuit, allowing the voltage to go high to the Instrument Cluster (IC), illuminating the fire suppression system indicator.

- DTC B29B3 (Fire Suppression Indicator Lamp Circuit Failure) - a continuous and on-demand DTC that sets if the FSSM detects a short to ground on the fire suppression indicator circuit 2318 (LG/RD).

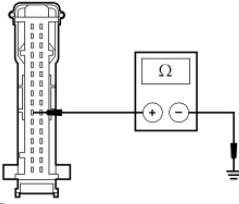
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- FSSM
- IC

**PINPOINT TEST L: THE FIRE SUPPRESSION SYSTEM INDICATOR IS NEVER ON (POLICE VEHICLES ONLY)**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>L1 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC fire suppression system indicator (SUSP_LAMP) active command on and off. Observe the charging system warning indicator.</li> <li>• <b>Does the fire suppression system warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">L2</a> .</p> <p><b>No</b> GO to <a href="#">L5</a> .</p>
<b>L2 RETRIEVE THE RECORDED DTCs FROM THE FSSM SELF-TEST</b>	

<ul style="list-style-type: none"> <li>• Check for recorded FSSM DTCs from the self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> If DTC B29B3 is recorded, GO to <u>L3</u> .</p> <p>For all other DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <u>L6</u> .</p>
<b>L3 CHECK THE FSSM FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: FSSM C3281a .</li> <li>• Ignition ON.</li> <li>• Monitor the fire suppression indicator with the FSSM disconnected.</li> <li>• <b>Does the fire suppression indicator turn on?</b></li> </ul>	<p><b>Yes</b> GO to <u>L6</u> .</p> <p><b>No</b> GO to <u>L4</u> .</p>
<b>L4 CHECK THE INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-10, circuit 2318 (LG/RD), harness side and ground.</li> </ul>  <p>N0027225</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>L5</u> .</p>
<b>L5 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>
<b>L6 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the battery. Refer to <u>Section 414-00</u> .</li> <li>• Wait approximately 60 seconds to allow the FSSM back-up power to discharge.</li> <li>• Disconnect the FSSM connector.</li> <li>• Check for:</li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Section 419-03</u> . TEST the system for normal operation.</p> <p><b>No</b></p>

<ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> <li>• Connect the FSSM connector and make sure it seats correctly.</li> <li>• Connect the battery.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. TEST the system for normal operation.</p>
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### Pinpoint Test M: The Fire Suppression System Indicator Is Always On

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

#### Normal Operation

If the Fire Suppression System Module (FSSM) detects a concern with any of the fire suppression system components, the fire suppression indicator illuminates and a DTC is logged.

The FSSM is hardwired to the Instrument Cluster (IC) through circuit 2318 (LG/RD), and is grounded through circuit 1203 (LG/RD). If a fault occurs in the fire suppression system, DTCs are set and the FSSM removes the ground circuit 2318 (LG/RD), sending the voltage high to the IC , illuminating the fire suppression system indicator.

- DTC B1921 (Air Bag Diagnostic Monitor Ground Circuit Open) - a continuous and on-demand DTC that sets if the FSSM detects an open or high resistance on the ground circuit 1203 (BK/LB).
- DTC B29B3 (Fire Suppression Indicator Lamp Circuit Failure) - a continuous and on-demand DTC that sets if the FSSM detects an open on the fire suppression indicator lamp circuit 2318 (LG/RD).
- DTC B29B4 (Fire Suppression Indicator Lamp Circuit Short to Battery) - sets if the FSSM detects a short to voltage on the fire suppression indicator lamp circuit 2318 (LG/RD) during prove-out at key-on, or when the fire suppression indicator lamp is activated.

**This pinpoint test is intended to diagnose the following:**

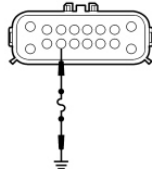
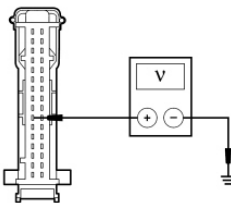
- Wiring, terminals or connectors
- FSSM
- IC

#### PINPOINT TEST M: THE FIRE SUPPRESSION SYSTEM INDICATOR IS ALWAYS ON

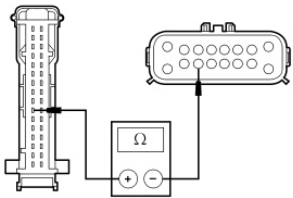
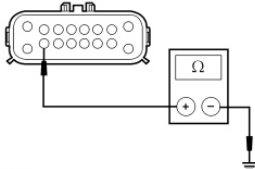
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>M1 VEHICLE IDENTIFICATION</b>	
<ul style="list-style-type: none"> <li>• Confirm whether the vehicle is a police vehicle or not.</li> <li>• <b>Is the vehicle a police vehicle?</b></li> </ul>	<p><b>Yes</b> GO to <u>M2</u></p> <p><b>No</b> GO to <u>M3</u></p>

<b>M2 RETRIEVE THE RECORDED DTCs FROM THE FSSM SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded FSSM DTCs from the self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> If DTC B1921 is recorded, GO to <u>M8</u> .</p> <p>If DTC B29B3 is recorded, GO to <u>M7</u> .</p> <p>If DTC B29B4 is recorded, GO to <u>M6</u> .</p> <p>For all other DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <u>M3</u> .</p>
<b>M3 CARRY OUT THE IC INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC all lamps (ALL_LAMP) active command on and off. Observe the fire suppression system indicator.</li> <li>• <b>Does the fire suppression system indicator illuminate when selected on, and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> If equipped with the fire suppression system, GO to <u>M5</u> .</p> <p>If not equipped with the fire suppression system, GO to <u>M4</u> .</p> <p><b>No</b> GO to <u>M8</u> .</p>
<b>M4 CHECK CIRCUIT 2318 (LG/RD) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Measure the resistance between the IC C2220-10, circuit 2318 (LG/RD), harness side and ground.</li> </ul> <div> <p>The diagram shows a vertical vehicle component with a multimeter connected to a terminal on its side. The multimeter is set to the resistance (Ω) mode. One lead is connected to the terminal, and the other lead is connected to a ground symbol. The component is labeled N0111516.</p> </div> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>M9</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p>
<b>M5 CHECK THE FIRE SUPPRESSION SYSTEM INDICATOR FOR CORRECT OPERATION</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the battery. Refer to <u>Section 414-01</u> .</li> <li>• Wait approximately 60 seconds to allow the FSSM back-up power to discharge.</li> <li>• Disconnect: FSSM C3281a .</li> <li>• Connect a fused jumper wire between the FSSM C3281a-6, circuit 2318 (LG/RD), harness side and ground.</li> </ul>  <p>N0088161</p> <ul style="list-style-type: none"> <li>• Connect the battery.</li> <li>• Ignition ON.</li> <li>• <b>Does the fire suppression system indicator turn off?</b></li> </ul>	<p><b>Yes</b> GO to <u>M10</u> .</p> <p><b>No</b> GO to <u>M9</u> .</p>
<b>M6 CHECK CIRCUIT 2318 (LG/RD) FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: FSSM C3281a .</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the IC C2220-10, circuit 2318 (LG/RD), harness side and ground.</li> </ul>  <p>N0027344</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>M9</u> .</p>
<b>M7 CHECK CIRCUIT 2318 (LG/RD) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: FSSM C3281a .</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-10, circuit 2318 (LG/RD), harness side and the FSSM C3281a-6, circuit 2318 (LG/RD), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>M9</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p>



 <p>N0072842</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>M8 CHECK CIRCUIT 1203 (BK/LB) FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: FSSM C3281a .</li> <li>• Measure the resistance between the FSSM C3281a-7, circuit 1203 (BK/LB), harness side and ground.</li> </ul>  <p>N0088298</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>M9</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p>
<b>M9 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>M10 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the battery. Refer to <u>Section 414-00</u> .</li> <li>• Wait approximately 60 seconds to allow the FSSM back-up power to discharge.</li> <li>• Disconnect the FSSM connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the FSSM connector and make sure it seats correctly.</li> <li>• Connect the battery.</li> <li>• Verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Section 419-03</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test N: The Air Suspension Indicator Is Never/Always On (If Equipped)****Normal Operation**

The air suspension warning indicator flashes and then stays on with the ignition switch in the RUN position and the air suspension service switch turned off or when a system malfunction is detected. The Instrument Cluster (IC) receives the air suspension status message from the Vehicle Dynamics Module (VDM) over the High Speed Controller Area Network (HS-CAN). If a fault occurs in the air suspension system, a DTC is set and the VDM sends a message to the IC to illuminate the air suspension indicator.

**This pinpoint test is intended to diagnose the following:**

- Air suspension system
- VDM
- IC

**PINPOINT TEST N: THE AIR SUSPENSION INDICATOR IS NEVER/ALWAYS ON (IF EQUIPPED)**

Test Step	Result / Action to Take
<b>N1 VERIFY THE OPERATION OF THE AIR SUSPENSION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Operate the air suspension system and verify that it operates correctly.</li> <li>• <b>Does the air suspension system operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>N2</u> .</p> <p><b>No</b> REFER to <u>Section 204-05</u> .</p>
<b>N2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC air suspension indicator (SUSP_LAMP) active command on and off. Observe the air suspension indicator.</li> <li>• <b>Does the air suspension indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Section 204-05</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test O: The High Beam Indicator Is Never/Always On****Normal Operation**

When the high beams are turned on, the Lighting Control Module (LCM) sends a signal to the Instrument Cluster (IC) over the Standard Corporate Protocol (SCP) communication network to illuminate the high beam indicator.

**This pinpoint test is intended to diagnose the following:**

- High beam headlamps
- LCM

- IC

**PINPOINT TEST O: THE HIGH BEAM INDICATOR IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>O1 CHECK THE HIGH BEAM HEADLAMPS</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Turn the high beam headlamps on. Observe the high beam headlamps.</li> <li>• <b>Do the high beam headlamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>O2</u> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> .</p>
<b>O2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC high beam indicator (HIGH_BEAM) active command on and off. Observe the high beam indicator.</li> <li>• <b>Does the high beam indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test P: The LH/RH Turn Indicator Is Never On**

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

**Normal Operation**

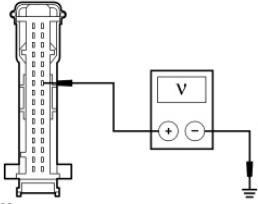
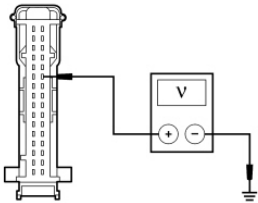
When the multifunction switch is in the LH TURN position, on/off voltage is sent from the multifunction switch to the Instrument Cluster (IC) through the LH turn input circuit flashing the left turn signal indicator on and off. When the multifunction switch is in the RH TURN position, on/off voltage is sent from the multifunction switch to the IC through the RH turn input circuit flashing the left turn signal indicator on and off.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LH turn signal lamps
- RH turn signal lamps
- IC

**PINPOINT TEST P: THE LH/RH TURN INDICATOR IS NEVER ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>P1 CHECK THE TURN SIGNAL LAMPS</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Operate the LH and RH turn signal. Observe the LH and RH turn signal lamps.</li> <li>• <b>Do the LH and RH turn signal lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> For the LH turn indicator, GO to <u>P2</u> . For the RH turn indicator, GO to <u>P3</u> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> .</p>
<b>P2 CHECK THE LH TURN INPUT CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Operate the LH turn signal.</li> <li>• Measure the voltage between the IC C2220-23, circuit 3 (LG/WH), harness side and ground.</li> </ul>  <p>N0027228</p> <ul style="list-style-type: none"> <li>• <b>Does the voltage alternate between 0 volts and greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>P4</u> .</p> <p><b>No</b> REPAIR the circuit for an open. TEST the system for normal operation.</p>
<b>P3 CHECK THE RH TURN INPUT CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Operate the RH turn signal.</li> <li>• Measure the voltage between the IC C2220-22, circuit 2 (WH/LB), harness side and ground.</li> </ul>  <p>N0027229</p> <ul style="list-style-type: none"> <li>• <b>Does the voltage alternate between 0 volts and greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>P4</u> .</p> <p><b>No</b> REPAIR the circuit for an open. TEST the system for normal operation.</p>
<b>P4 CHECK FOR CORRECT IC OPERATION</b>	

<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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**Pinpoint Test Q: The ABS Warning Indicator Is Never/Always On****Normal Operation**

The ABS warning indicator is used to indicate an ABS concern or deactivation of the ABS. The Instrument Cluster (IC), upon receipt of the ABS message from the ABS module over the High Speed Controller Area Network (HS-CAN), turns on the ABS warning indicator.

**This pinpoint test is intended to diagnose the following:**

- ABS module
- IC

**PINPOINT TEST Q: THE ABS WARNING INDICATOR IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>Q1 RETRIEVE THE RECORDED DTCs FROM THE ABS MODULE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded ABS module DTCs from the self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 206-09</u> to continue diagnosis of the ABS system.</p> <p><b>No</b> GO to <u>Q2</u> .</p>
<b>Q2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC ABS warning indicator (ABS_LAMP) active command on and off. Observe the ABS warning indicator.</li> <li>• <b>Does the ABS warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <u>Section 206-09</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test R: The Traction Control Indicator Is Never/Always On (If Equipped)****Normal Operation**

**Normal Operation**

The traction control indicator informs the driver that a traction control event is taking place, by flashing the traction control indicator during the event. The traction control indicator illuminates constantly when a malfunction is detected in the traction control system, or if the traction control system is disabled by the operator. The ABS module monitors the traction control event and sends the Instrument Cluster (IC) a Controller Area Network (CAN) message to illuminate the traction control indicator.

**This pinpoint test is intended to diagnose the following:**

- ABS module
- IC

**PINPOINT TEST R: THE TRACTION CONTROL INDICATOR IS NEVER/ALWAYS ON (IF EQUIPPED)**

Test Step	Result / Action to Take
<b>R1 RETRIEVE THE RECORDED DTCs FROM THE ABS MODULE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded ABS module DTCs from the self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 206-09</a> to continue diagnosis of the ABS system.</p> <p><b>No</b> GO to <a href="#">R2</a> .</p>
<b>R2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC traction control indicator (ACTIVELMP) active command on and off. Observe the traction control indicator.</li> <li>• <b>Does the traction control indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <a href="#">Section 206-09</a> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section. TEST the system for normal operation.</p>

**Pinpoint Test S: The Low Oil Pressure Warning Indicator Is Never/Always On**

Refer to Wiring Diagrams Cell [60](#) , Instrument Cluster for schematic and connector information.

**Normal Operation**

The engine oil pressure switch is a normally open switch that is hardwired to the Instrument Cluster (IC) through a single input circuit. When the engine oil pressure is within normal ranges, the engine oil pressure switch closes and grounds the signal to the IC , and the IC turns off the low oil pressure warning indicator. When engine oil pressure is low, the engine oil pressure switch opens, removing the ground signal to the IC , and the IC illuminates the low oil pressure warning indicator.

**This pinpoint test is intended to diagnose the following:**

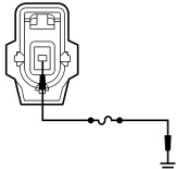
- Wiring, terminals or connectors

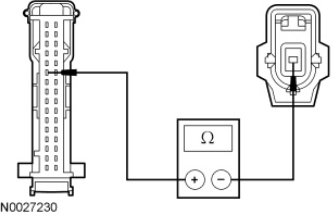
- Base engine concern
- Engine oil pressure switch
- IC

**PINPOINT TEST S: THE LOW OIL PRESSURE WARNING INDICATOR IS NEVER/ALWAYS ON**

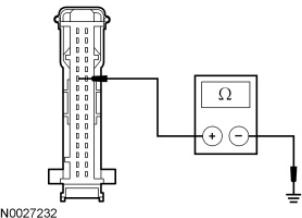
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTICE:** The electrical power to the air suspension system must be turned off prior to hoisting, jacking or towing an air suspension vehicle. Failure to do so can result in unexpected inflation or deflation of the air springs, which can result in shifting of the vehicle during these operations. Failure to follow these instructions may result in personal injury.

Test Step	Result / Action to Take
<b>S1 DETERMINE IF THE LOW OIL PRESSURE WARNING INDICATOR IS ALWAYS ON</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Observe the low oil pressure warning indicator.</li> <li>• <b>Is the low oil pressure warning indicator illuminated?</b></li> </ul>	<p><b>Yes</b> GO to <u>S2</u> .</p> <p><b>No</b> GO to <u>S5</u> .</p>
<b>S2 CHECK THE LOW OIL INDICATOR OPERATION</b>	
<p><b>⚠ WARNING:</b> Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 419-03</u> . Failure to follow the instructions may result in serious personal injury.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Engine Oil Pressure Switch C103 .</li> <li>• <b>NOTE:</b> If the fused jumper wire fails, repair circuit 31 (WH/RD) for a short to voltage.</li> <li>• Connect a fused jumper wire between the oil pressure switch C103-1, circuit 31 (WH/RD), harness side and ground.</li> </ul>  <p>A0089586</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>Does the low oil pressure warning indicator illuminate?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>S3</u> .</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>S4</u> .</p>
<b>S3 CHECK THE LOW OIL PRESSURE INPUT CIRCUIT FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-6, circuit 31 (WH/RD), and the oil pressure switch C103-1, circuit 31 (WH/RD), harness side and ground.</li> </ul>  <p>N0027230</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>S7</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation. If equipped with the fire suppression system, GO to <u>S8</u> .</p>
<b>S4 CARRY OUT THE ENGINE OIL PRESSURE TEST</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Carry out the engine oil pressure test. Refer to <u>Section 303-00</u> .</li> <li>• <b>Is the engine oil pressure within specification?</b></li> </ul>	<p><b>Yes</b> INSTALL a new Engine Oil Pressure (EOP) switch. REFER to <u>Section 303-01</u> . TEST the system for normal operation. If equipped with the fire suppression system, GO to <u>S8</u> .</p> <p><b>No</b> REFER to <u>Section 303-00</u> to continue diagnosis of the oil pressure system. If equipped with the fire suppression system, GO to <u>S8</u> .</p>
<b>S5 CARRY OUT THE IC PROVE OUT</b>	
<p><b>⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in <u>Section 419-03</u> . Failure to follow the instructions may result in serious personal injury.</b></p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Engine Oil Pressure Switch C103 .</li> <li>• Ignition ON.</li> <li>• Observe the low oil pressure indicator after the IC prove out.</li> <li>• <b>Does the low oil pressure warning indicator illuminate after the IC prove out?</b></li> </ul>	<p><b>Yes</b> INSTALL a new Engine Oil Pressure (EOP) switch. REFER to <u>Section 303-01</u> . TEST the system for normal operation. If equipped with the fire suppression system, GO to <u>S8</u> .</p> <p><b>No</b> GO to <u>S6</u> .</p>
<b>S6 CHECK THE LOW OIL PRESSURE INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-6, circuit 31 (WH/RD), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>S7</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation. If equipped with the fire</p>



 <p>• Is the resistance greater than 10,000 ohms?</p>	<p>suppression system, GO to <u>S8</u> .</p>
<b>S7 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. If equipped with the fire suppression system, GO to <u>S8</u> .</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. If equipped with the fire suppression system, GO to <u>S8</u> .</p>
<b>S8 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<p><b>⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 419-03</u> . Failure to follow these instructions may result in serious personal injury.</b></p> <ul style="list-style-type: none"> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 419-03</u> .</li> <li>• Is the fire suppression system repowered?</li> </ul>	<p><b>Yes</b> The fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 419-03</u> for the fire suppression system depowering and repowering procedure.</p>

### Pinpoint Test T: The Malfunction Indicator Lamp (MIL) Is Never/Always On

#### Normal Operation

The Malfunction Indicator Lamp (MIL) informs the driver of a malfunction in the powertrain that affects the vehicle emissions system. The MIL is illuminated when a fault condition is detected by the PCM and a DTC has been set. The Instrument Cluster (IC) receives the MIL data from the PCM over the High Speed Controller Area Network (HS-CAN).

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

**PINPOINT TEST T: THE MIL IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>T1 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>Retrieve the recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li><b>Are any PCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>T2</u> .</p>
<b>T2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>Ignition ON.</li> <li>Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>Select the IC MIL active command (MIL_IC) on and off. Observe the MIL .</li> <li><b>Does the MIL illuminate when selected on and turn off when selected off?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test U: The Air Bag Warning Indicator Is Never/Always On**

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

**Normal Operation**

The air bag warning indicator receives voltage through the Instrument Cluster (IC) when the ignition switch is in the START/RUN position. The IC monitors the air bag warning indicator control circuit and illuminates the air bag warning indicator based upon the air bag signal received from the Restraints Control Module (RCM). The IC illuminates the air bag warning indicator when it receives an open (no ground) from the RCM on the air bag warning indicator control circuit. The IC turns off the air bag warning indicator if it receives a ground signal from the RCM on the air bag warning indicator control circuit.

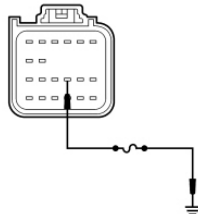
- DTC B1869 (Lamp Air Bag Warning Indicator Circuit Open) - a continuous and on-demand DTC that sets if the RCM detects an open or short to ground on the restraints indicator lamp circuit.
- DTC B1870 (Lamp Air Bag Warning Indicator Circuit Short To Battery) - a continuous and on-demand DTC that sets if the RCM detects a short to voltage on the restraints indicator lamp circuit during prove-out at key-on, or when the air bag warning indicator lamp is activated.

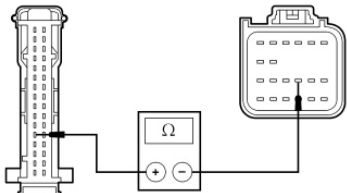
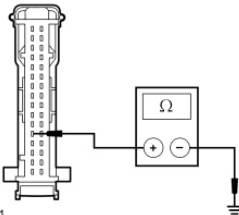
**This pinpoint test is intended to diagnose the following:**

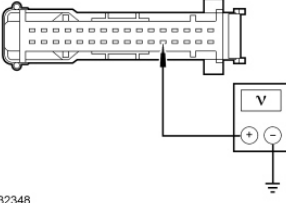
- Wiring, terminals or connectors
- RCM
- IC

**PINPOINT TEST U: THE AIR BAG WARNING INDICATOR IS NEVER/ALWAYS ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>U1 RETRIEVE THE RECORDED DTCs FROM THE RCM SELF-TEST</b>	
<ul style="list-style-type: none"> <li>Check for recorded RCM DTCs from the self-test.</li> <li><b>Are any RCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> If DTC B1869 is present with the air bag warning indicator always on, GO to <u>U2</u> .</p> <p>If DTC B1869 is present with the air bag warning indicator never on, GO to <u>U4</u> .</p> <p>If DTC B1870 is present, GO to <u>U6</u> .</p> <p>All other DTCs, REFER to <u>Section 501-20B</u> .</p> <p><b>No</b> GO to <u>U2</u> .</p>
<b>U2 CHECK THE RCM FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>Depower the Supplemental Restraint System (SRS). Refer to <u>Section 501-20B</u> .</li> <li>Ignition OFF.</li> <li>Disconnect: RCM C310a .</li> <li>Connect the battery. Refer to <u>Section 414-01</u> .</li> <li>Connect a fused jumper wire between the RCM C310a-15, circuit 608 (BK/YE), harness side and ground.</li> </ul>  <p>N0027347</p> <ul style="list-style-type: none"> <li>Ignition ON.</li> <li><b>Does the air bag indicator lamp turn off after the IC proves out?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>U8</u> .</p> <p><b>No</b> REMOVE the jumper wire.</p> <p>If DTC B1869 is present, GO to <u>U3</u> .</p> <p>If no DTCs are present, GO to <u>U9</u> .</p>
<b>U3 CHECK THE AIR BAG WARNING INDICATOR CONTROL CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: IC C2220 .</li> <li>Measure the resistance between the IC C2220-12, circuit 608 (BK/YE), harness side and the RCM C310a-15, circuit 608 (BK/YE), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>U9</u> .</p> <p><b>No</b> REPAIR the circuit. REPOWER the SRS . REFER to <u>Section 501-20B</u> . TEST the system for normal operation.</p>

 <p>N0027348</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>U4 CHECK THE RCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Depower the SRS . Refer to <a href="#">Section 501-20B</a> .</li> <li>• Ignition OFF.</li> <li>• Disconnect: RCM C310a .</li> <li>• Connect the battery. Refer to <a href="#">Section 414-01</a> .</li> <li>• Ignition ON.</li> <li>• Does the air bag indicator lamp illuminate after the IC proves out?</li> </ul>	<p><b>Yes</b> GO to <a href="#">U8</a> .</p> <p><b>No</b> GO to <a href="#">U5</a> .</p>
<b>U5 CHECK THE AIR BAG WARNING INDICATOR CONTROL CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the IC C2220-12, circuit 608 (BK/YE), harness side and ground.</li> </ul>  <p>N0027351</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">U9</a> .</p> <p><b>No</b> REPAIR the circuit. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p>
<b>U6 CHECK THE IC FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: RCM Self-Test .</li> <li>• Clear the RCM DTCs.</li> <li>• Carry out the RCM self-test.</li> <li>• Is DTC B1870 present?</li> </ul>	<p><b>Yes</b> GO to <a href="#">U7</a> .</p> <p><b>No</b> GO to <a href="#">U9</a> .</p>
<b>U7 CHECK THE AIR BAG WARNING INDICATOR CONTROL CIRCUIT FOR A SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Depower the SRS . Refer to <a href="#">Section 501-20B</a> .</li> <li>• Disconnect: RCM C310a .</li> <li>• Connect the battery. Refer to <a href="#">Section 414-01</a> .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the IC C2220-12, circuit 608 (BK/YE), harness side and ground.</li> </ul>  <p>N0032348</p> <ul style="list-style-type: none"> <li>• <b>Is any voltage present?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <a href="#">U8</a> .</p>
<b>U8 CHECK FOR CORRECT RCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the RCM connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the RCM connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>U9 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section.</p> <p>REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test V: The Cruise Control Indicator Is Never/Always On****Normal Operation**

The Instrument Cluster (IC) receives the cruise control data from the PCM over the High Speed Controller Area Network (HS-CAN). When the cruise control is engaged, the PCM provides a signal to the IC to illuminate the cruise control indicator.

**This pinpoint test is intended to diagnose the following:**

Normal Operation

- Cruise control system
- PCM
- IC

**PINPOINT TEST V: THE CRUISE CONTROL INDICATOR IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>V1 CHECK THE CRUISE CONTROL OPERATION</b>	
<ul style="list-style-type: none"> <li>• Verify the cruise control operates.</li> <li>• <b>Does the cruise control operate correctly?</b></li> </ul>	<b>Yes</b> GO to <u>V2</u> .  <b>No</b> REFER to <u>Section 419-03</u> .
<b>V2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC cruise control indicator (SC_SET) active command on and off. Observe the cruise control indicator.</li> <li>• <b>Does the cruise control indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.  <b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.

**Pinpoint Test W: The Powertrain Malfunction (Wrench) Warning Indicator Is Never/Always On****Normal Operation**

The PCM monitors the electronic throttle control and the transmission system and provides the Instrument Cluster (IC) with the operating status over the Controller Area Network (CAN). When a system concern is detected, the PCM provides the IC with a command signal to the IC to illuminate the powertrain malfunction (wrench) warning indicator.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

**PINPOINT TEST W: THE POWERTRAIN MALFUNCTION (WRENCH) WARNING INDICATOR IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>W1 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
	<b>Yes</b> REFER to the Powertrain Control/Emissions

<ul style="list-style-type: none"> <li>Retrieve the recorded PCM DTCs from the continuous and on-demand self-tests.</li> <li><b>Are any DTCs recorded?</b></li> </ul>	Diagnosis (PC/ED) manual.  <b>No</b> GO to <u>W2</u> .
<b>W2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>Ignition ON.</li> <li>Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>Select the IC powertrain malfunction (wrench) warning indicator (NON_MIL) active command on and off. Observe the powertrain malfunction (wrench) warning indicator.</li> <li><b>Does the powertrain malfunction (wrench) warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.  <b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.

### Pinpoint Test X: The Door/Trunk Ajar Warning Indicator Is Inoperative (Chime Is Operative)/Does Not Operate Correctly

#### Normal Operation

When any door is open and the ignition switch is in the RUN position, the Driver Door Module (DDM) sends the Instrument Cluster (IC) a message over the Standard Corporate Protocol (SCP) communication network to illuminate the door/trunk ajar warning indicator.

**This pinpoint test is intended to diagnose the following:**

- Interior lamps
- DDM
- IC

### PINPOINT TEST X: THE DOOR/TRUNK AJAR WARNING INDICATOR IS INOPERATIVE (CHIME IS OPERATIVE)/DOES NOT OPERATE CORRECTLY

Test Step	Result / Action to Take
<b>X1 CHECK THE OPERATION OF THE INTERIOR LAMPS</b>	
<ul style="list-style-type: none"> <li>Open and close each door, and the luggage compartment lid, and monitor the interior lamps and the luggage compartment lamp.</li> <li><b>Do the interior lamps and the luggage compartment lamp operate correctly?</b></li> </ul>	<b>Yes</b> GO to <u>X2</u> .  <b>No</b> REFER to <u>Section 417-02</u> .
<b>X2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>Ignition ON.</li> </ul>	<b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC all lamps (ALL_LAMP) active command on and off. Observe the door/trunk ajar warning indicator.</li> <li>• <b>Does the door/trunk ajar warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<p>operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
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### Pinpoint Test Y: The Overdrive (O/D) Off Indicator Is Never/Always On

#### Normal Operation

The Instrument Cluster (IC) receives the Overdrive (O/D) off signal from the PCM over the High Speed Controller Area Network (HS-CAN). The O/D off switch is hardwired to the PCM through the overdrive off switch control circuit. When the transmission overdrive is turned off, the overdrive off switch provides a voltage signal to the PCM. The PCM, upon receipt of the overdrive off input signal, provides an O/D off signal to the IC and the IC turns on the O/D OFF indicator.

**This pinpoint test is intended to diagnose the following:**

- Transmission O/D off function
- PCM
- IC

#### PINPOINT TEST Y: THE O/D OFF INDICATOR IS NEVER/ALWAYS ON

Test Step	Result / Action to Take
<b>Y1 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Retrieve the recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>Y2</u> .</p>
<b>Y2 CHECK THE O/D OPERATION</b>	
<ul style="list-style-type: none"> <li>• Verify that the O/D system operates correctly.</li> <li>• <b>Does the O/D system operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>Y3</u> .</p> <p><b>No</b> REFER to <u>Section 307-05</u> .</p>
<b>Y3 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b></p>



<ul style="list-style-type: none"> <li>• Select the IC all lamps (ALL_LAMP) active command on and off. Observe the O/D off indicator.</li> <li>• <b>Does the O/D off indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.
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### Pinpoint Test Z: The Engine Over-Temperature Warning Indicator Is Never/Always On

#### Normal Operation

The PCM receives the engine coolant temperature status through hardwired circuitry from the Cylinder Head Temperature (CHT) sensor. The IC receives the engine coolant temperature data from the PCM over the High Speed Controller Area Network (HS-CAN). The IC monitors the engine coolant temperature data received from the PCM and when the engine coolant temperature is high, or if the vehicle has entered a failsafe cooling mode, the engine over-temperature warning indicator illuminates.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

#### PINPOINT TEST Z: THE ENGINE OVER-TEMPERATURE WARNING INDICATOR IS NEVER/ALWAYS ON

Test Step	Result / Action to Take
<b>Z1 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li>• <b>Are any PCM DTCs recorded?</b></li> </ul>	<b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.  <b>No</b> GO to <u>Z2</u> .
<b>Z2 CARRY OUT THE IC INDICATOR LAMP ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC all lamps (ALL_LAMP) active command on and off. Observe the engine over-temperature warning indicator.</li> <li>• <b>Does the engine over-temperature warning indicator illuminate when selected on and turn off when selected off?</b></li> </ul>	<b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.  <b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.

### Pinpoint Test AA: The Tire Pressure Monitoring System (TPMS) Warning Indicator Is Never/Always On

**Normal Operation**

Each road tire is equipped with a tire pressure sensor fastened to the inside rim of the wheel. The pressure sensor is covered by the tire and is not visible unless the tire is removed. The tire-mounted pressure sensors transmit signals to the DDM by using the valve stem as an antenna. These signals are sent approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The DDM compares each tire pressure sensor signal against low and high pressure limits. If the DDM determines that the tire pressure has exceeded the limit, the DDM communicates over the Medium Speed Controller Area Network (MS-CAN) to the IC , which then illuminates the Tire Pressure Monitoring System (TPMS) warning indicator. If a TPMS fault condition exists, the DDM sends a message to the IC to flash the TPMS warning indicator.

**This pinpoint test is intended to diagnose the following:**

- TPMS concern
- DDM
- IC

**PINPOINT TEST AA: THE TPMS WARNING INDICATOR IS NEVER/ALWAYS ON**

Test Step	Result / Action to Take
<b>AA1 CHECK THE TIRE PRESSURE AND VERIFY IF THE RECOMMENDED TIRE PRESSURES ARE DIFFERENT BETWEEN THE FRONT AND REAR TIRES</b>	
<ul style="list-style-type: none"> <li>• Verify that the tire pressure in all tires meets the recommended tire pressures on the vehicle certification label. Refer to <u>Section 100-01</u> .</li> <li>• <b>Do all the tires meet the recommended tire pressures?</b></li> </ul>	<p><b>Yes</b> GO to <u>AA2</u> .</p> <p><b>No</b> CORRECT the tire pressures. TEST the system for normal operation.</p>
<b>AA2 CARRY OUT THE IC INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the TPMS warning indicator (TPM_IND) active command. Command the TPMS warning indicator on and off. Observe the TPMS warning indicator.</li> <li>• <b>Does the TPMS warning indicator illuminate when commanded on and turn off when commanded off?</b></li> </ul>	<p><b>Yes</b> GO to <u>AA3</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
<b>AA3 RETRIEVE THE RECORDED DTCs FROM THE IC SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded IC DTCs from the self-test.</li> <li>• <b>Is DTC U1900 recorded?</b></li> </ul>	<p><b>Yes</b> REPAIR all other DTCs first. CLEAR the DTCs. CYCLE the key OFF then ON and wait 10 seconds. REPEAT the self-test.</p>

	<p>If DTC U1900 is still present, REFER to <u>Section 418-00</u> to diagnose communication with the DDM .</p> <p><b>No</b> GO to <u>AA4</u> .</p>
<b>AA4 RETRIEVE THE RECORDED DTCs FROM THE DDM SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded DDM DTCs from the continuous and on-demand self-tests.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 419-10</u> .</p> <p><b>No</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p>

**Pinpoint Test AB: The Engine Idle Hour Meter Is Inoperative (If Equipped)****Normal Operation**

The Instrument Cluster (IC) receives the digital Transmission Range (TR) sensor status message from the PCM over the HS-CAN , and if the engine speed is greater than 400 rpm, it records the amount of time the engine runs with the transmission in PARK (P) or NEUTRAL (N).

**This pinpoint test is intended to diagnose the following:**

- IC

**PINPOINT TEST AB: THE ENGINE IDLE HOUR METER IS INOPERATIVE (IF EQUIPPED)**

Test Step	Result / Action to Take
<b>AB1 CHECK THE TACHOMETER OPERATION</b>	
<ul style="list-style-type: none"> <li>• Start the engine and verify the tachometer operates correctly.</li> <li>• <b>Does the tachometer operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>AB2</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test D</u> .</p>
<b>AB2 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li>• <b>Are any PCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 307-01</u> to continue diagnosis of the digital Transmission Range (TR) sensor.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test AC: Incorrect Speedometer Indication****Normal Operation**

The PCM calculates vehicle speed from the transmission Output Shaft Speed (OSS) sensor input and from the tire size and axle ratio configuration in the Vehicle Identification (VID) block of the PCM. The PCM provides the Instrument Cluster (IC) with the Vehicle Speed Sensor (VSS) signal over the High Speed Controller Area Network (HS-CAN) communication bus. The IC monitors the VSS input from the PCM and commands the speedometer with a corresponding movement of the pointer. Factors that could potentially affect the accuracy of the speedometer are configurable items such as tire size and axle ratio.

The IC provides a tolerance which biases the speed indication and allows the gauge to display between 3% lower and 7% higher than the actual vehicle speed. This means that with an actual vehicle speed of 96.6 km/h (60 mph), the speedometer may indicate between 93.7-103.3 km/h (58.2-64.2 mph). Other factors that could potentially affect the speedometer accuracy are incorrect tire size, tire size configuration and axle ratio configuration.

**This pinpoint test is intended to diagnose the following:**

- Tire size configuration
- Axle ratio configuration
- PCM concern
- IC

**PINPOINT TEST AC: INCORRECT SPEEDOMETER INDICATION**

Test Step	Result / Action to Take
<b>AC1 CHECK THE TIRE SIZE CONFIGURATION</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Module Programming .</li> <li>• <b>NOTE:</b> The correct tire size can be found on the vehicle certification label on the LH B-pillar. Refer to <a href="#">Section 100-01</a> .</li> <li>• Select programmable parameters and verify that the vehicle has the correct tire size according to the certification label and the tire size is correctly configured in the PCM.</li> <li>• <b>Is the tire size correct and is the tire size parameter correctly configured?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AC2</a> .</p> <p><b>No</b> CONFIGURE the tire size. TEST the system for normal operation.</p>
<b>AC2 CHECK THE AXLE RATIO CONFIGURATION</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Module Programming .</li> <li>• Select programmable parameters and verify that the axle ratio is correctly configured in the PCM.</li> <li>• <b>Is the axle ratio parameter correctly configured?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AC3</a> .</p> <p><b>No</b> CONFIGURE the axle ratio. TEST the system for normal operation.</p>
<b>AC3 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check the recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions</p>

<ul style="list-style-type: none"> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p>Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>AC4</u> .</p>
<b>AC4 RETRIEVE THE RECORDED DTCs FROM THE IC SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded DTCs from the IC self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> For DTC U1900, REPAIR all other DTCs first. CLEAR the DTCs. CYCLE the key OFF then ON and wait 10 seconds. REPEAT the self-test.</p> <p>If DTC U1900 is still present, REFER to <u>Section 418-00</u> .</p> <p>For DTC U2023, RETRIEVE and REPAIR all non-network DTCs in the PCM and other modules on the network. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>For all other DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <u>AC5</u> .</p>
<b>AC5 OBSERVE THE SPEEDOMETER OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Observe the speedometer while driving the vehicle at various speeds and stopping frequently.</li> <li>• <b>Does the speedometer begin at 0 km/h (0 mph), indicate the different vehicle speeds and fully return to the 0 km/h (0 mph) position when the vehicle is stopped?</b></li> </ul>	<p><b>Yes</b> GO to <u>AC6</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
<b>AC6 CARRY OUT THE SPEEDOMETER ACTIVE COMMAND USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the speedometer (SPDOMETER) active command and command the speedometer in increments of approximately 10%. Observe the speedometer. The speedometer starts at 0 km/h (0 mph) and moves approximately 19 km/h (12 mph) for each 10%</li> </ul>	<p><b>Yes</b> GO to <u>AC7</u> .</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for</p>

increment. • <b>Does the speedometer begin at 0 km/h (0 mph) and move by approximately 19 km/h (12 mph) for each 10% increment?</b>	normal operation.
<b>AC7 CHECK THE IC VSS INPUT</b>	
• Ignition ON. • Enter the Instrument Cluster (IC) Dealer Test Mode. • <b>NOTE:</b> The display below uses xxx's to represent a numeric or alpha-numeric value. The value may display the same amount of characters represented by the xxx's or there may be more/less depending on the type of display. For example: E xxx.x (base cluster) or xxx.x MPH (message center cluster) may display E 25 (base cluster) or 25 MPH (message center cluster). Note that there were 3 x's in the display description but only 2 digits in the actual display. • Scroll through the displays to E xxx.x (base cluster) or xxx.x MPH (message center cluster). • Monitor the speedometer and the vehicle speed input at various vehicle speeds. • <b>Does the speedometer approximately match the vehicle speed input?</b>	<b>Yes</b> The speedometer is operating correctly at this time.  <b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.

### Pinpoint Test AD: The Message Center Is Not Operating Correctly

#### Normal Operation

The message center functionality is controlled through the message center switch. The RESET and SETUP buttons are hardwired to the Instrument Cluster (IC) through a single input circuit. The INFO and SELECT buttons are also hardwired to the IC through a separate input circuit. All the message center switch buttons are routed back to the IC through a single return circuit. Each message center switch uses a different resistance value allowing the IC to determine which switch is pressed.

DTC Description	Fault Trigger Conditions
• B1205 - EIC Switch-1 Assembly Circuit Failure	A continuous or on-demand DTC that sets if the IC detects a stuck RESET or SETUP switch, or a switch that has been pressed for longer than 2 minutes, on the RESET and SETUP input circuit.
• B1206 - EIC Switch-1 Assembly Circuit Open	A continuous or on-demand DTC that sets if the IC detects an open on the RESET and SETUP input circuit.
• B1208 - EIC Switch-1 Assembly Circuit Short To Ground	A continuous or on-demand DTC that sets if the IC detects a short to ground on the RESET and SETUP input circuit.
• B1209 - EIC Switch-2 Assembly	A continuous or on-demand DTC that sets if the IC detects a stuck INFO or SELECT switch, or a switch that has been pressed for longer than 2 minutes, on circuit 152 (LB/WH).

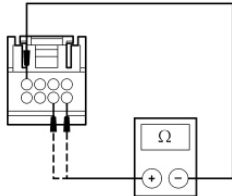
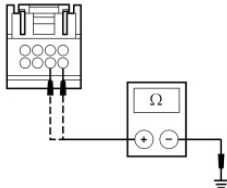
Circuit Failure	
<ul style="list-style-type: none"> <li>• B1210 - EIC Switch-2 Assembly Circuit Open</li> </ul>	A continuous or on-demand DTC that sets if the IC detects an open on the INFO and SELECT input circuit.
<ul style="list-style-type: none"> <li>• B1212 - EIC Switch-2 Assembly Circuit Short To Ground</li> </ul>	A continuous or on-demand DTC that sets if the IC detects a short to ground on the INFO and SELECT input circuit.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Message center switch
- IC

**PINPOINT TEST AD: THE MESSAGE CENTER IS NOT OPERATING CORRECTLY**

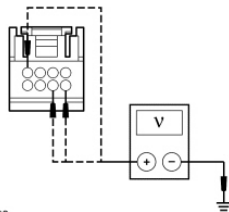
Test Step	Result / Action to Take
<b>AD1 CHECK THE MESSAGE CENTER DISPLAY OPERATION USING THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC display (SEGMENTS_2) active command on and off. Observe the message center display.</li> <li>• <b>Does the message center display illuminate all segments?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AD2</a> .</p> <p><b>No</b> GO to <a href="#">AD8</a> .</p>
<b>AD2 RETRIEVE THE RECORDED DTCs FROM THE IC SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Retrieve the recorded IC DTCs from the self-test.</li> <li>• <b>Are any DTCs retrieved?</b></li> </ul>	<p><b>Yes</b> For DTC B1205 or DTC B1209, CLEAR the DTCs. REPEAT the self-test. If DTC B1205 or DTC B1209 is still present, INSTALL a new message center switch. REFER to <a href="#">Message Center Switch</a> in this section.</p> <p>For DTC B1208 or DTC B1212, GO to <a href="#">AD3</a> .</p> <p>For DTC B1206 or</p>

	<p>DTC B1210, GO to <u>AD5</u> .</p> <p><b>No</b> GO to <u>AD7</u> .</p>						
<b>AD3 CHECK THE MESSAGE CENTER INPUT AND RETURN CIRCUITS FOR A SHORT BETWEEN THE CIRCUITS</b>							
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Disconnect: Message Center Switch C253 .</li> <li>• Measure the resistance between the message center switch C253-5, circuit 143 (LB/YE), harness side and the message center switch C253-4, circuit 1411 (GY/OG), harness side; and between the message center switch C253-6, circuit 152 (LB/WH), harness side and the message center switch C253-4, circuit 1411 (GY/OG), harness side.</li> </ul>  <p>N0027358</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>AD4</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p>						
<b>AD4 CHECK THE MESSAGE CENTER SWITCH CIRCUITS FOR A SHORT TO GROUND</b>							
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the message center switch, harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C253-5</td><td>143 (LB/YE)</td></tr> <tr> <td>C253-6</td><td>152 (LB/WH)</td></tr> </tbody> </table>  <p>N0088162</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances greater than 10,000?</b></li> </ul>	Connector-Pin	Circuit	C253-5	143 (LB/YE)	C253-6	152 (LB/WH)	<p><b>Yes</b> GO to <u>AD8</u> .</p> <p><b>No</b> REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.</p>
Connector-Pin	Circuit						
C253-5	143 (LB/YE)						
C253-6	152 (LB/WH)						
<b>AD5 CHECK THE MESSAGE CENTER SWITCH CIRCUITS FOR A SHORT TO VOLTAGE</b>							



- Ignition OFF.
- Disconnect: IC C2220 .
- Disconnect: Message Center Switch C253 .
- Ignition ON.
- Measure the voltage between the message center switch harness side and ground as follows:

Connector-Pin	Circuit
C253-4	1411 (GY/OG)
C253-5	143 (LB/YE)
C253-6	152 (LB/WH)



- Is any voltage present?

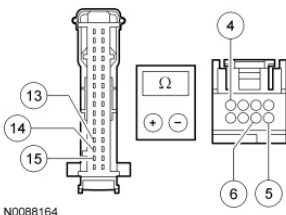
**Yes**  
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

**No**  
GO to AD6 .

#### AD6 CHECK THE MESSAGE CENTER SWITCH CIRCUITS FOR AN OPEN

- Ignition OFF.
- Measure the resistance between the IC , harness side and the message center switch, harness side as follows:

IC Connector-Pin	Message Center Switch Connector-Pin	Circuit
C2220-13	C253-4	1411 (GY/OG)
C2220-14	C253-5	143 (LB/YE)
C2220-15	C253-6	152 (LB/WH)



- Are the resistances less than 5 ohms?

**Yes**  
GO to AD7 .

**No**  
REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

#### AD7 CHECK THE MESSAGE CENTER SWITCHES

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 (If Directed Here From Test Step AD2) .</li> <li>• Connect: IC C2220 (If Directed Here From Test Step AD6) .</li> <li>• Measure the resistance between the IC connector harness side as follows:</li> </ul>				<p><b>Yes</b> GO to <u>AD8</u> .</p> <p><b>No</b> INSTALL a new message center switch. REFER to <u>Message Center Switch</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p>
IC Connector-Pin	Message Center Switch Pressed	IC Connector-Pin	Resistance Reading	
C2220-13	-	C2220-14	1,600-1,800 ohms	
C2220-13	RESET	C2220-14	580-600 ohms	
C2220-13	SETUP	C2220-14	250-270 ohms	
C2220-13	-	C2220-15	1,600-1,800 ohms	
C2220-13	INFO	C2220-15	580-600 ohms	
C2220-13	SELECT	C2220-15	250-270 ohms	
<ul style="list-style-type: none"> <li>• Are the resistance values within the specifications?</li> </ul>				
<b>AD8 CHECK FOR CORRECT IC OPERATION</b>				
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>				<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.</p>

### Pinpoint Test AE: The LOW WASHER FLUID LEVEL Message Is Inoperative/Always On

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

#### Normal Operation

The Instrument Cluster (IC) is hardwired to the low washer fluid switch through a single input circuit. The low washer fluid switch closes when the washer fluid level is low, providing a ground to the IC through the input circuit and turning on the LOW WASHER FLUID LEVEL message. When the washer fluid is above the low level, the low washer fluid switch opens, removing the ground to the IC , and the LOW WASHER FLUID LEVEL message turns off.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Washer fluid reservoir
- IC

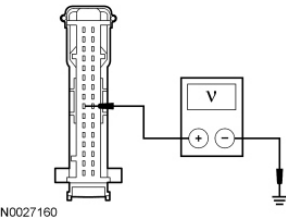
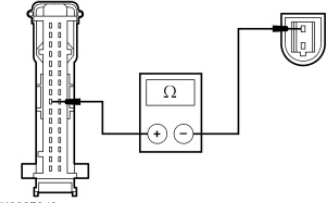
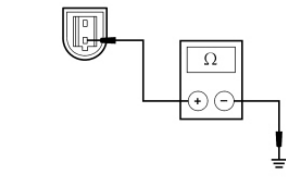
**PINPOINT TEST AE: THE LOW WASHER FLUID LEVEL MESSAGE IS INOPERATIVE/ALWAYS ON**

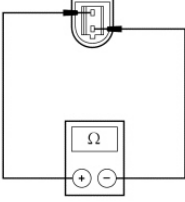
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Verify that the washer fluid reservoir is full and that the key is cycled at least once prior to carrying out the pinpoint test.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>AE1 DETERMINE THE CONDITION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• With the washer fluid reservoir full, observe the message center LOW WASHER FLUID LEVEL message.</li> <li>• <b>Does the LOW WASHER FLUID LEVEL message illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>AE2</u> .</p> <p><b>No</b> GO to <u>AE3</u> .</p>
<b>AE2 CHECK THE LOW WASHER FLUID INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Washer Fluid Level Switch C138 .</li> <li>• Disconnect: IC C2220 .</li> <li>• Measure the resistance between the washer fluid level switch C138-1, circuit 82 (PK/YE), harness side and ground.</li> </ul> <div> </div> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>AE6</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>AE3 CHECK THE LOW WASHER FLUID INPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the IC C2220-9, circuit 82 (PK/YE), harness side and ground.</li> </ul>  <p>N0027160</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p><b>No</b> GO to <a href="#">AE4</a> .</p>
<b>AE4 CHECK THE LOW WASHER FLUID INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Washer Fluid Level Switch C138 .</li> <li>• Measure the resistance between the IC C2220-9, circuit 82 (PK/YE), harness side and the washer fluid level switch C138-1, circuit 82 (PK/YE), harness side.</li> </ul>  <p>N0027340</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AE5</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>AE5 CHECK THE WASHER FLUID LEVEL SWITCH GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable .</li> <li>• Measure the resistance between the washer fluid level switch C138-2, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0027158</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AE6</a> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>AE6 CHECK THE WASHER FLUID LEVEL SWITCH</b>	

<ul style="list-style-type: none"> <li>• Measure the resistance between the washer fluid level switch C138 pin 1, component side and the washer fluid level switch C138 pin 2, component side, with the reservoir empty, and with washer fluid in the reservoir.</li> </ul>  <p>A0027834</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms with the reservoir empty, and greater than 10,000 ohms with the reservoir filled?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AE7</a> .</p> <p><b>No</b> INSTALL a new washer fluid level switch. REFER to <a href="#">Section 501-16</a> . TEST the system for normal operation.</p>
<b>AE7 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test AF: The DOOR AJAR Warning Is Inoperative**

Refer to Wiring Diagrams Cell [60](#) , Instrument Cluster for schematic and connector information.

**Normal Operation**

The door ajar switches are hardwired to the Driver Door Module (DDM). When any door is open and the ignition key is in the RUN position, the DDM sends the Instrument Cluster (IC) a message over the Standard Corporate Protocol (SCP) communication network to illuminate the door ajar warning indicator.

**This pinpoint test is intended to diagnose the following:**

- Interior lamp system
- DDM
- IC

**PINPOINT TEST AF: THE DOOR AJAR WARNING IS INOPERATIVE**

Test Step	Result / Action to Take
<b>AF1 CHECK THE OPERATION OF THE INTERIOR LAMPS</b>	

<ul style="list-style-type: none"> <li>• Open and close each door and monitor the interior lamps.</li> <li>• <b>Do the interior lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AF2</a> .</p> <p><b>No</b> REFER to <a href="#">Section 417-02</a> .</p>
<b>AF2 MONITOR THE DDM PIDs</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger .</li> <li>• <b>NOTE:</b> The passenger door ajar PID sets when the RF passenger door, LR passenger door or RR passenger doors are ajar.</li> <li>• Select the DDM driver door ajar PID (D_DR_SW) and passenger door PID (P_DR_SW). Monitor the DDM PIDs while opening and closing the doors.</li> <li>• <b>Do the PIDs agree with the door position?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p>

**Pinpoint Test AG: The TRUNK AJAR Message Is Inoperative/Always On**

Refer to Wiring Diagrams Cell [60](#) , Instrument Cluster for schematic and connector information.

**Normal Operation**

When the luggage compartment is open and the ignition switch is in the RUN position, the Lighting Control Module (LCM) sends the Instrument Cluster (IC) a message over the Standard Corporate Protocol (SCP) communication network to illuminate the trunk ajar message.

- DTC B1334 (Decklid Ajar Rear Door Circuit Short to Ground) - an on-demand DTC that sets if the LCM detects a short to ground on the decklid ajar input circuit.

**This pinpoint test is intended to diagnose the following:**

- Luggage compartment lamp
- LCM

**PINPOINT TEST AG: THE TRUNK AJAR MESSAGE IS INOPERATIVE/ALWAYS ON**

Test Step	Result / Action to Take
<b>AG1 CHECK THE DOOR AJAR WARNING OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Close all the doors.</li> <li>• Open the driver door while monitoring the message center.</li> <li>• <b>Does the message center display DOOR AJAR?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AG2</a> .</p> <p><b>No</b> <a href="#">GO to Pinpoint Test AF</a> .</p>
<b>AG2 RETRIEVE THE RECORDED DTCs FROM THE LCM SELF-TEST</b>	

<ul style="list-style-type: none"> <li>Retrieve the recorded LCM DTCs from the self-test.</li> <li>Is DTC B1334 retrieved?</li> </ul>	<b>Yes</b> REFER to <a href="#">Section 417-02</a> .  <b>No</b> GO to <a href="#">AG3</a> .
<b>AG3 CHECK THE OPERATION OF THE LUGGAGE COMPARTMENT LAMP</b>	
<ul style="list-style-type: none"> <li>Open and close the luggage compartment lid and monitor the luggage compartment lamp.</li> <li>Does the luggage compartment lamp operate with the luggage compartment lid open and turn off with the luggage compartment lid closed?</li> </ul>	<b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.  <b>No</b> REFER to <a href="#">Section 417-02</a> .

**Pinpoint Test AH: The Headlamps On Warning Chime Does Not Operate Correctly****Normal Operation**

The Lighting Control Module (LCM) monitors the headlamp switch input and the driver door ajar switch input, sounding a chime if the driver door is open, the headlamps or parking lamps are on, and the ignition switch is not in the ON position.

This pinpoint test is intended to diagnose the following:

- LCM

**PINPOINT TEST AH: THE HEADLAMPS ON WARNING CHIME DOES NOT OPERATE CORRECTLY**

Test Step	Result / Action to Take
<b>AH1 CHECK THE PARKING LAMPS OPERATION</b>	
<ul style="list-style-type: none"> <li>Place the headlamp switch in the PARKING LAMPS ON position.</li> <li>Are the parking lamps illuminated?</li> </ul>	<b>Yes</b> GO to <a href="#">AH2</a> .  <b>No</b> REFER to <a href="#">Section 417-01</a> .
<b>AH2 CHECK THE INTERIOR LAMPS OPERATION</b>	
<ul style="list-style-type: none"> <li>Open the driver door and observe the interior lamps.</li> <li>Are the interior lamps illuminated?</li> </ul>	<b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.  <b>No</b> REFER to <a href="#">Section 417-02</a> .

**Pinpoint Test AI: The Air Bag/Safety Belt Warning Chime Is Inoperative**

**Normal Operation**

The Lighting Control Module (LCM) sounds the air bag warning chime when it receives a chime request signal from the Restraints Control Module (RCM) through circuit 1083 (LB/PK).

**This pinpoint test is intended to diagnose the following:**

- LCM

**PINPOINT TEST AI: THE AIR BAG/SAFETY BELT WARNING CHIME IS INOPERATIVE**

Test Step	Result / Action to Take
<b>AI1 RETRIEVE THE RECORDED RCM DTCs FROM THE SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded RCM DTCs from the self-test.</li> <li>• <b>Are any DTCs present?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 501-20B</a> .</p> <p><b>No</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p>

**Pinpoint Test AJ: The Key-In-Ignition Warning Chime Is Inoperative**

Refer to Wiring Diagrams Cell [13](#) , Power Distribution for schematic and connector information.

Refer to Wiring Diagrams Cell [58](#) , Lighting Control Module for schematic and connector information.

**Normal Operation**

When the key is inserted into the ignition lock cylinder, the key-in-ignition switch (part of the ignition switch) closes to the Lighting Control Module (LCM), providing a voltage signal. The voltage input signals the LCM that the key is inserted. If the LCM detects that the ignition switch is in the OFF or ACC position, the key is inserted in the ignition lock cylinder, and the driver door is ajar, the key-in-ignition warning chime sounds.

- DTC B1352 (Ignition Key-In Circuit Failure) - a continuous DTC that sets if the LCM detects a key-in signal inactive while RUN/ACC and/or RUN/START are active. It is also an on-demand DTC that sets if the LCM detects that the key is not in or that the key-in-ignition input circuit is open or short to ground.

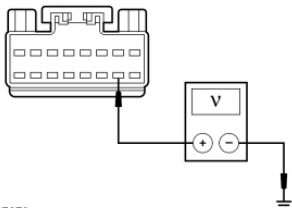
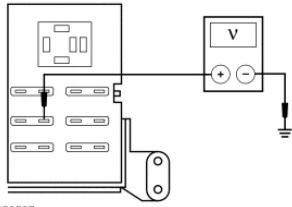
**This pinpoint test is intended to diagnose the following:**

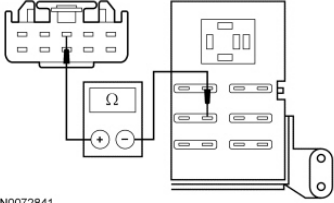
- Fuse
- Wiring, terminals or connectors
- Key-in-ignition warning switch (part of the ignition switch)
- LCM



**PINPOINT TEST AJ: THE KEY-IN-IGNITION WARNING CHIME IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>AJ1 CHECK THE LCM FOR STORED DTCs</b>	
<ul style="list-style-type: none"> <li>Check for recorded LCM DTCs from the continuous and on-demand self-tests.</li> <li><b>Is DTC B1352 present?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AJ3</a> .</p> <p><b>No</b> GO to <a href="#">AJ2</a> .</p>
<b>AJ2 CHECK THE INTERIOR LAMPS OPERATION</b>	
<ul style="list-style-type: none"> <li>Open the driver door and observe the interior lamps.</li> <li><b>Are the interior lamps illuminated?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AJ6</a> .</p> <p><b>No</b> REFER to <a href="#">Section 417-02</a> .</p>
<b>AJ3 CHECK THE KEY-IN-IGNITION INPUT CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Disconnect: LCM C2145a .</li> <li>Insert the key into the ignition lock cylinder.</li> <li>Measure the voltage between the LCM C2145a-10, circuit 158 (BK/PK), harness side and ground.</li> </ul>  <p>N0027273</p> <ul style="list-style-type: none"> <li><b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AJ6</a> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 31 (5A) is OK. If OK, GO to <a href="#">AJ4</a> . If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>AJ4 CHECK FUSE 31 INPUT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Measure the voltage between the CJB fuse 31, circuit 1716 (GY/YE), and ground.</li> </ul>  <p>N0053587</p> <ul style="list-style-type: none"> <li><b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 158 (BK/PK) for an open. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <a href="#">AJ5</a> .</p>

<b>AJ5 CHECK THE KEY-IN-IGNITION INPUT CIRCUIT BETWEEN THE IGNITION SWITCH AND THE CJB FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Ignition Switch C250 .</li> <li>• Remove CJB fuse 31 (5A).</li> <li>• Measure the resistance between the ignition switch C250-3, circuit 1716 (GY/YE), harness side and the CJB fuse 31, circuit 1716 (GY/YE).</li> </ul>  <p style="text-align: center;">N0072841</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> INSTALL a new ignition switch. REFER to <u>Section 211-05</u> . CLEAR the DTCs. REPEAT the self-test.</p>
<b>AJ6 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test AK: The Door Ajar Warning Chime Does Not Operate Correctly

Refer to Wiring Diagrams Cell 58 , Lighting Control Module for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) monitors the driver door ajar input and ignition input sounding the door ajar warning chime when the ignition switch is in the ON position and the luggage compartment lid or a door is ajar.

**This pinpoint test is intended to diagnose the following:**

- Door ajar input
- Luggage compartment lid latch
- LCM

**PINPOINT TEST AK: THE DOOR AJAR WARNING CHIME DOES NOT OPERATE CORRECTLY**

Test Step	Result / Action to Take
<b>AK1 CHECK THE DOOR AJAR AND TRUNK AJAR MESSAGE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Open and close the driver door and the luggage compartment lid while observing the message center.</li> <li>• <b>Does the message center display DOOR AJAR or TRUNK AJAR with the driver door or luggage compartment lid open and turn off when closed?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> <u>GO to Pinpoint Test AF</u> (DOOR AJAR) or <u>GO to Pinpoint Test AG</u> (TRUNK AJAR).</p>

**Pinpoint Test AL: The Chime Sounds When The Driver Door Is Ajar (No Key In Ignition And Headlamps Off)**

Refer to Wiring Diagrams Cell [13](#) , Power Distribution for schematic and connector information.

Refer to Wiring Diagrams Cell [58](#) , Lighting Control Module for schematic and connector information.

**Normal Operation**

When the key is inserted into the ignition lock cylinder, the key-in-ignition switch (part of the ignition switch) closes the key-in-ignition input circuit to the Lighting Control Module (LCM), providing a voltage signal. The voltage input signals the LCM that the key is inserted. If the LCM detects that the ignition switch is in the OFF or ACC position, the key is inserted in the ignition lock cylinder, and the driver door is ajar, the key-in-ignition warning chime sounds.

The LCM monitors the headlamp switch input and the driver door ajar switch input, sounding a chime if the driver door is open, the parking lamps are on, and the ignition switch is not in the ON position.

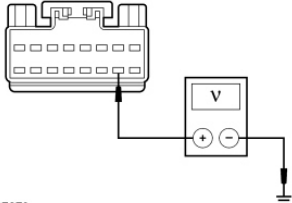
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Key-in-ignition switch (part of the ignition switch)
- LCM

**PINPOINT TEST AL: THE CHIME SOUNDS WHEN THE DRIVER DOOR IS AJAR (NO KEY IN IGNITION AND HEADLAMPS OFF)**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>AL1 CHECK THE PARKING LAMPS OPERATION</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the PARKING LAMPS ON position.</li> </ul>	<p><b>Yes</b> GO to <a href="#">AL2</a> .</p>

<ul style="list-style-type: none"> <li>• Are the parking lamps illuminated?</li> </ul>	<b>No</b> REFER to <a href="#">Section 417-01</a> .
<b>AL2 CHECK THE KEY-IN-IGNITION INPUT CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Turn the parking lamps off.</li> <li>• Disconnect: LCM C2145a .</li> <li>• Remove the key from the ignition lock cylinder.</li> <li>• Measure the voltage between the LCM C2145a-10, circuit 158 (BK/PK), harness side and ground.</li> </ul>  <p>N0027273</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<b>Yes</b> GO to <a href="#">AL3</a> .  <b>No</b> GO to <a href="#">AL4</a> .
<b>AL3 CHECK THE IGNITION SWITCH FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Ignition Switch C250 .</li> <li>• Carry out the ignition switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <a href="#">149</a> for component testing.</p> <ul style="list-style-type: none"> <li>• Does the ignition switch pass the component test?</li> </ul>	<b>Yes</b> REPAIR circuit 158 (BK/PK) or 1716 (GY/YE) for a short to voltage. TEST the system for normal operation.  <b>No</b> INSTALL a new ignition switch. REFER to <a href="#">Section 211-05</a> . TEST the system for normal operation.
<b>AL4 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.  <b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

### Pinpoint Test AM: The Turn Signal On Warning Chime Is Inoperative

**Normal Operation**

The turn signal on warning chime is an internal function of the Lighting Control Module (LCM). The LCM monitors the turn signal switch status and receives the odometer rolling count data from the Instrument Cluster (IC) over the Medium Speed Controller Area Network (MS-CAN) communication bus.

**This pinpoint test is intended to diagnose the following:**

- Turn signal on warning chime disabled
- LCM

**PINPOINT TEST AM: THE TURN SIGNAL ON WARNING CHIME IS INOPERATIVE**

Test Step	Result / Action to Take
<b>AM1 CHECK THE LCM CONFIGURATION</b>	
<ul style="list-style-type: none"> <li>• Verify the turn signal on warning chime is enabled.</li> <li>• <b>Is the turn signal warning chime enabled?</b></li> </ul>	<p><b>Yes</b> GO to <u>AM2</u> .</p> <p><b>No</b> ENABLE the turn signal on warning chime function. REFER to <u>Section 418-01</u> . TEST the system for normal operation.</p>
<b>AM2 CHECK OPERATION OF THE TURN SIGNALS</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Operate the turn signals.</li> <li>• <b>Do the turn signal lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>AM3</u> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> .</p>
<b>AM3 CHECK ODOMETER OPERATION IN THE IC</b>	
<ul style="list-style-type: none"> <li>• Observe the odometer display.</li> <li>• <b>Does the odometer operate correctly?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> .</p> <p><b>No</b> GO to Pinpoint Test AP .</p>

**Pinpoint Test AN: DTC B1317**

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

**Normal Operation**

- DTC B1317 (Battery Voltage High) - a continuous memory DTC that sets if the IC detects battery voltage above 16 volts on the B+ keep alive circuit.

**This pinpoint test is intended to diagnose the following:**

- Charging system concern
- IC

**PINPOINT TEST AN: DTC B1317**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** DTC B1317 may be stored in the module memory due to past battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
<b>AN1 CHECK FOR DTC B1317, B1676 OR P0563 SET IN OTHER MODULES</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self-Test .</li> <li>• Retrieve the continuous memory DTCs from all modules.</li> <li>• <b>Is DTC B1317, B1676 or P0563 (PCM) set in more than one module?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <a href="#">AN2</a> .</p>
<b>AN2 CHECK THE BATTERY VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Turn off all interior/exterior lights and accessories.</li> <li>• Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage.</li> <li>• <b>Does the battery voltage rise to 15.5 volts or higher?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <a href="#">AN3</a> .</p>
<b>AN3 RECHECK FOR DTC B1317</b>	
<ul style="list-style-type: none"> <li>• Turn the engine off.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Self-Test .</li> <li>• Clear the continuous memory DTCs.</li> <li>• Carry out the IC self-test.</li> <li>• <b>Is DTC B1317 present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating normally at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.</p>

**Pinpoint Test AO: DTC B1318**

Refer to Wiring Diagrams Cell [60](#) , Instrument Cluster for schematic and connector information.

- DTC B1318 (Battery Voltage Low) - a continuous memory DTC that sets if the IC detects battery voltage below 9 volts on the B+ keep alive circuit.

**This pinpoint test is intended to diagnose the following:**

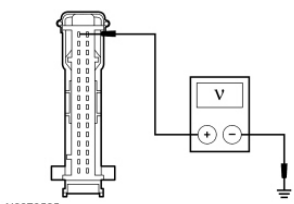
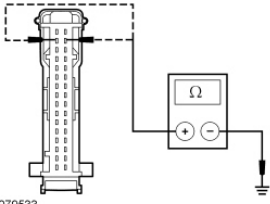
- Wiring, terminals or connectors
- High circuit resistance
- IC

**PINPOINT TEST AO: DTC B1318**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
<b>AO1 RECHECK THE IC DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC Self-Test .</li> <li>• Clear the DTCs. Repeat the IC self-test.</li> <li>• <b>Is DTC B1318 still present?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AO2</a> .</p> <p><b>No</b> The system is operating correctly at this time. The DTC may have been set due to a previous low battery voltage condition.</p>
<b>AO2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: PCM Self-Test .</li> <li>• Carry out the PCM Key ON Engine OFF (KOEO) self-test.</li> <li>• Retrieve the continuous memory DTCs from all modules.</li> <li>• <b>Is DTC P0620, P0622, P0625, P0626 or P065B set in the PCM?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> .</p> <p><b>No</b> GO to <a href="#">AO3</a> .</p>
<b>AO3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE</b>	
<ul style="list-style-type: none"> <li>• Check the battery condition and verify that the battery is fully charged. Refer to <a href="#">Section 414-01</a> .</li> <li>• <b>Is the battery OK and fully charged?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AO4</a> .</p> <p><b>No</b> REFER to <a href="#">Section 414-01</a> .</p>
<b>AO4 CHECK THE IC VOLTAGE SUPPLY</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure and record the voltage at the battery.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Monitor and compare the IC voltage PID (VBAT_1) against the measured battery voltage.</li> <li>• <b>Is the voltage PID within 0.2 volt of the recorded battery voltage?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AO7</a> .</p> <p><b>No</b> GO to <a href="#">AO5</a> .</p>

AO5 CHECK THE IC VOLTAGE SUPPLY	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220 .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the IC C2220-1, circuit 1523 (DG), harness side and ground.</li> </ul>  <p>N0079525</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage within 0.2 volt of the recorded battery voltage?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AO6</a> .</p> <p><b>No</b> REPAIR the circuit for high resistance. CLEAR the DTC. REPEAT the self-test.</p>
AO6 CHECK THE IC GROUND CIRCUIT	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable .</li> <li>• Measure the resistance between the IC C2220-2, circuit 676 (PK/OG), harness side and ground; and between the IC C2220-18, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0079533</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">AO7</a> .</p> <p><b>No</b> REPAIR the circuit for high resistance. CLEAR the DTCs. REPEAT the self-test.</p>
AO7 CHECK FOR CORRECT IC OPERATION	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Instrument Cluster (IC)</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test AP: The Odometer Is Inoperative**



**Normal Operation**

The Instrument Cluster (IC) receives voltage from the Central Junction Box (CJB) through the RUN circuit. The instrument cluster receives the odometer rolling count from the PCM over the High Speed Controller Area Network (HS-CAN). If the IC receives invalid odometer data from the PCM, the odometer displays all dashes (----) and sets DTC U2023.

**This pinpoint test is intended to diagnose the following:**

- PCM
- IC

**PINPOINT TEST AP: THE ODOMETER IS INOPERATIVE**

Test Step	Result / Action to Take
<b>AP1 CHECK FOR CORRUPTED NON-VOLATILE MEMORY (NVM)</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Observe the message center display area.</li> <li>• <b>Does the odometer display ERROR?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>AP2</u> .</p>
<b>AP2 RETRIEVE THE RECORDED DTCs FROM THE PCM KOEO SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded PCM DTCs from the Key ON Engine OFF (KOEO) self-test.</li> <li>• <b>Are any PCM DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p><b>No</b> GO to <u>AP3</u> .</p>
<b>AP3 RETRIEVE THE RECORDED DTCs FROM THE IC SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Check for recorded DTCs from the IC self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> For DTC U1900, REPAIR all other DTCs first. CLEAR the DTCs. CYCLE the key OFF then ON and wait 10 seconds. REPEAT the self-test.</p> <p>If DTC U1900 is still present, REFER to <u>Section 418-00</u> .</p> <p>For DTC U2023, RETRIEVE and REPAIR all non-network DTCs in the PCM and other modules on the network. REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>For all other DTCs, REFER to DTC Charts in this section.</p> <p><b>No</b></p>

	<p>If the odometer is inoperative for base cluster, GO to <u>AP4</u> .</p> <p>If the odometer is inoperative for message center cluster, GO to <u>AP5</u> .</p>
<b>AP4 MONITOR THE DISPLAY SEGMENT CONTROL DISPLAY (BASE CLUSTER)</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: IC DataLogger .</li> <li>• Select the IC display segment control (SEGMENTS_2) active command and illuminate the display segments.</li> <li>• <b>Do the display segments illuminate correctly?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>
<b>AP5 CHECK THE MESSAGE CENTER DISPLAY</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Operate the message center through all of the display functions.</li> <li>• <b>Do all of the message center displays illuminate correctly?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new IC . REFER to <u>Instrument Cluster (IC)</u> in this section. TEST the system for normal operation.</p>

## **Message Center Configuration**

### **Oil Life Reset**

1. Press the SETUP button to display PRESS SELECT TO BEGIN SYSTEM CHECK.
2. Press the SELECT button to display OIL LIFE - PRESS RESET IF NEW OIL.
3. Press and hold the RESET button to display OIL LIFE START VALUE SET TO XXX% is displayed. The oil life is now set to 100%.

### **Oil Life Start Value**

1. Press the SETUP button until OIL LIFE START VALUE PRESS SELECT TO CHANGE is displayed.
  2. Press and release the SELECT button until the desired start value is displayed.
-

## **Belt-Minder® Deactivating/Activating**

### **Preparation**

1. Before deactivating/activating the Belt-Minder®, set the parking brake.
2. Place the transmission range selector lever in PARK (P).
3. Place the ignition switch in the OFF position.
4. Close all the vehicle doors.
5. Unbuckle the driver and the front passenger safety belts.
6. Place the parking lamps/headlamps switch in the OFF position.

### **Deactivating/Activating**

1. Turn the ignition lock cylinder to the ON position (do not start the engine).
2. Wait until the safety belt warning indicator turns off (approximately 1 minute).
3. **NOTE:** Step 3 must be completed within 50 seconds after the safety belt warning indicator turns off.

For the seating position being disabled, at a moderate speed, buckle then unbuckle the safety belt 9 times, ending with the safety belt in the unbuckled state. After this step the air bag warning indicator illuminates for 3 seconds.

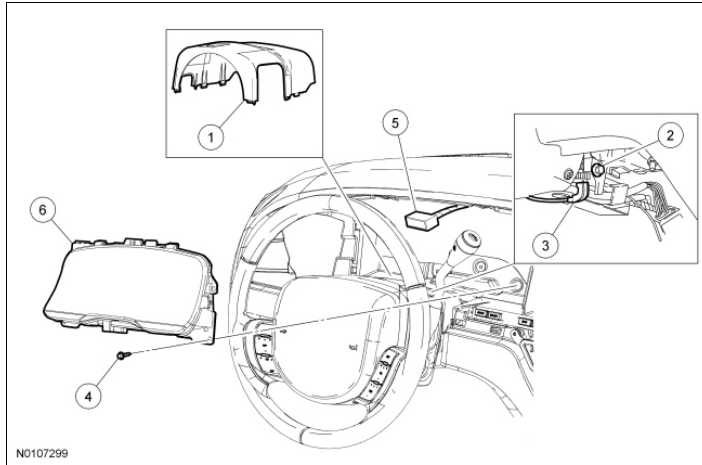
4. Within 10 seconds of the air bag warning indicator turning on, buckle then unbuckle the safety belt.
    - This disables the Belt-Minder® feature for that seating position, if it is currently enabled. As confirmation, the air bag warning indicator flashes 4 times per second for 3 seconds.
    - This enables the Belt-Minder® feature for that seating position, if it is currently disabled. As confirmation, the air bag warning indicator flashes 4 times per second for 3 seconds, followed by 3 seconds off, and then 4 times per second for 3 seconds.
  5. After confirmation, the deactivation/activation procedure is complete.
-



SECTION 413-01: Instrumentation, Message Center, and  
Warning Chimes  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

### Instrument Cluster (IC)



Item	Part Number	Description
1	3530	Upper steering column shroud
2	-	Transmission range indicator screw (column shift vehicles)
3	7A110	Transmission range indicator (column shift vehicles)
4	-	Instrument Cluster (IC) screws (4 required)
5	-	Electrical connector (part of 14401)
6	10849	IC

### Removal and Installation

1. **NOTE:** If installing a new Instrument Cluster (IC), it is necessary to upload the IC configuration information to the scan tool. For additional information, refer to [Section 418-01](#).

Remove the instrument cluster finish panel. For additional information, refer to [Section 501-12](#).

2. Depower the Supplemental Restraint System (SRS). For additional information, refer to [Section 501-20B](#).

3. **NOTE:** Release the upper steering column shroud by pressing the sides inward.

Remove the upper steering column shroud.

4. Remove the screw and the transmission range indicator from the steering column.
  - Disconnect the transmission range indicator cable from the shift selector arm.
5. Remove the 4 screws and the IC.
  - Disconnect the electrical connector.

6. To install, reverse the removal procedure.
  - If a new IC was installed, download the IC configuration information from the scan tool into the new IC. For additional information, refer to [Section 418-01](#).

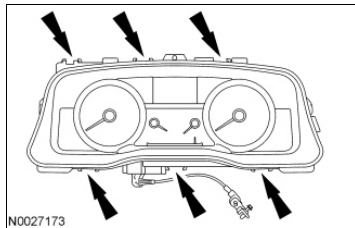


## Instrument Cluster (IC) Lens

### Removal and Installation

**NOTE:** The Instrument Cluster (IC) lens and the mask are removed and installed as an assembly.

1. Remove the IC . For additional information, refer to Instrument Cluster (IC) in this section.
2. Release the 6 black clips and remove the IC lens/mask assembly.



3. To install, reverse the removal procedure.
-

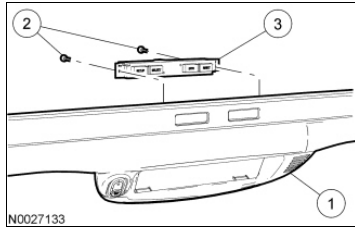


SECTION 413-01: Instrumentation, Message Center, and  
Warning Chimes

## REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

**Message Center Switch**

Item	Part Number	Description
1	046A62	RH instrument panel finish panel
2	-	Message center switch screws (2 required)
3	10D889	Message center switch

**Removal and Installation**

1. **NOTE:** The RH instrument panel finish panel is held in place with spring clips located on the RH instrument panel finish panel.

Remove the RH instrument panel finish panel.

- Disconnect the electrical connectors.

2. Remove the 2 screws and the message center switch.
3. To install, reverse the removal procedure.

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Horn nut	20	177

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## **Horn**

The horn system consists of the following components:

- Horn switch (part of the driver air bag module)
- Clockspring
- Steering wheel switch harness
- Horn relay
- Horn
- Lighting Control Module (LCM)



## **Horn Location**

The horn is mounted on the RH side of the core support behind the radiator grille.

---

**Horn**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 105-R025D or equivalent

**Principles of Operation**

The horn switch is incorporated within the driver air bag module. When the switch is pressed, ground is supplied through the clockspring to the vehicle harness. The horn relay is then energized, supplying voltage to the horn, enabling the horn to sound. The horn relay is located in the Battery Junction Box (BJB).

**Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Horn</li> <li>• Horn switch (part of the driver air bag module)</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 10 (20A)</li> <li>• Horn relay</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the fault is not visually evident, verify the symptom. GO to Symptom Chart .

**Symptom Chart**

## Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: The Horn Is Inoperative

Refer to Wiring Diagrams Cell 44 , Horn/Cigar Lighter for schematic and connector information.

#### Normal Operation

The horn relay control voltage and switched voltage circuits are supplied by the Battery Junction Box (BJB). The horn relay is controlled by the horn switch. When the horn switch is pressed, the horn relay is grounded from the clockspring to the vehicle harness. The horn relay is then energized, causing voltage to be applied to the horn, enabling the horn to sound.

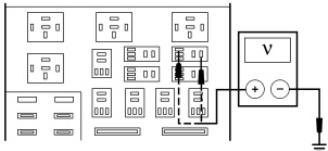
**This pinpoint test is intended to diagnose the following:**

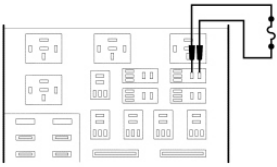
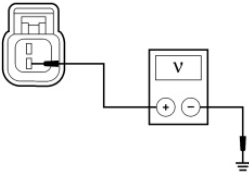
- Fuse
- Wiring, terminals or connectors
- Horn
- Horn relay
- Steering wheel harness
- Clockspring
- Horn switch (part of the driver air bag module)

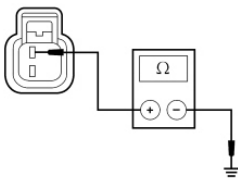
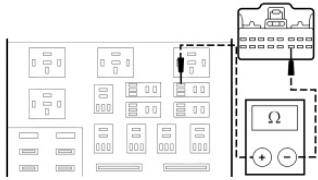
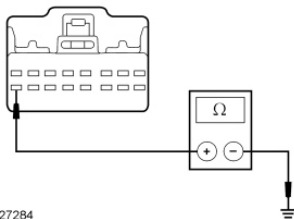
#### PINPOINT TEST A: THE HORN IS INOPERATIVE

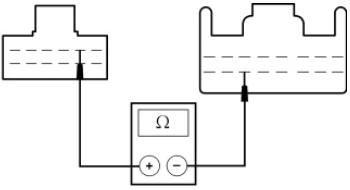
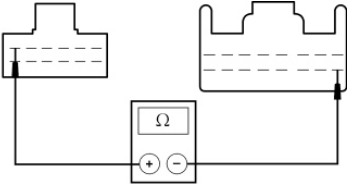
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>A1 CHECK FOR VOLTAGE TO THE HORN RELAY</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Horn Relay.</li> <li>• Measure the voltage between the horn relay pin 1, circuit 1680 (OG/RD), harness side and ground; and between the horn relay pin 3, circuit 1680 (OG/RD), harness side and ground.</li> </ul>  <p>N0107575</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> VERIFY the BJB fuse 10 (20A) is OK. If OK, REPAIR circuit 1680 (OG/RD) for a short to ground. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>

<b>A2 CHECK THE HORN RELAY</b>	
<ul style="list-style-type: none"> <li>• Install a known good relay and check the horn operation.</li> <li>• <b>Does the horn sound?</b></li> </ul>	<p><b>Yes</b> REMOVE the known good relay. INSTALL a new horn relay. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the known good relay. GO to <u>A3</u> .</p>
<b>A3 CHECK THE HORN RELAY OUTPUT CIRCUITRY</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the horn relay pin 3, circuit 1680 (OG/RD), harness side and the horn relay pin 5, circuit 6 (YE/LG), harness side.</li> </ul>  <p>N0053462</p> <ul style="list-style-type: none"> <li>• <b>Does the horn sound?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>A6</u> .</p> <p><b>No</b> LEAVE the jumper wire connected. GO to <u>A4</u> .</p>
<b>A4 CHECK THE HORN INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Horn C131.</li> <li>• Measure the voltage between the horn C131-2, circuit 6 (YE/LG), harness side and ground.</li> </ul>  <p>N0090544</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>A5</u> .</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 6 (YE/LG) for an open. TEST the system for normal operation.</p>
<b>A5 CHECK THE HORN GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the horn C131-1, circuit 57 (BK), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new horn. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>

 <p>N0013051</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<p><b>A6 CHECK THE CIRCUIT BETWEEN THE HORN RELAY AND THE CLOCKSPRING FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Depower the Supplemental Restraint System (SRS). Refer to <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Clockspring C218a.</li> <li>• Measure the resistance between the clockspring C218a-11, circuit 1 (DB), harness side and the horn relay pin 1, circuit 1 (DB), harness side.</li> </ul>  <p>N0053464</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A7</a>.</p> <p><b>No</b> REPAIR circuit 1 (DB) for an open. REPOWER the SRS. REFER to <a href="#">Section 501-20B</a>. TEST the system for normal operation.</p>
<p><b>A7 CHECK CLOCKSPRING GROUND CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the clockspring C218a-16, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0027284</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A8</a>.</p> <p><b>No</b> REPAIR circuit 676 (PK/OG) for an open. REPOWER the SRS. REFER to <a href="#">Section 501-20B</a>. TEST the system for normal operation.</p>
<p><b>A8 CHECK THE CLOCKSPRING FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Remove the driver air bag module. Refer to <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Upper Clockspring C218b.</li> <li>• Ignition OFF.</li> <li>• Measure the resistance between the upper clockspring C218b pin 5, component side and the clockspring C218a pin 11, component side.</li> </ul>	<p><b>Yes</b> GO to <a href="#">A9</a>.</p> <p><b>No</b> INSTALL a new clockspring. REFER to <a href="#">Section 501-20B</a>. TEST the system for normal operation.</p>

 <p>N0072726</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the upper clockspring C218b pin 1, component side and the clockspring C218a pin 16, component side.</li> </ul>  <p>N0072727</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>A9 CHECK THE STEERING WHEEL HARNESS FOR OPENS OR SHORTS</b>	
<ul style="list-style-type: none"> <li>• Inspect the steering wheel harness for opens or shorts.</li> <li>• Is the steering wheel harness OK?</li> </ul>	<p><b>Yes</b> INSTALL a new driver air bag module. REFER to <u>Section 501-20B</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR or INSTALL a new steering wheel harness. INSTALL the driver air bag module. REFER to <u>Section 501-20B</u> . TEST the system for normal operation.</p>

### Pinpoint Test B: The Horn Is Always On

Refer to Wiring Diagrams Cell 44 , Horn/Cigar Lighter for schematic and connector information.

#### Normal Operation

The horn relay control voltage and switched voltage circuits are supplied by the Battery Junction Box (BJB). The horn relay is controlled by the horn switch. When the horn switch is pressed, the horn relay is grounded through the clockspring to the vehicle harness. The Lighting Control Module (LCM) also supplies a ground to the horn relay for the anti-theft function. The LCM supplies a momentary ground to the horn relay to indicate the anti-theft system is armed, and an on then off ground when an intrusion is detected. The horn relay is then energized, causing voltage to be applied to the horn, enabling the horn to sound.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Horn relay
- LCM
- Clockspring



- Horn switch (part of the driver air bag module)
- Steering wheel harness

**PINPOINT TEST B: THE HORN IS ALWAYS ON**

Test Step	Result / Action to Take
<b>B1 CHECK THE HORN INPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Horn Relay.</li> <li>• <b>Does the horn continue to sound?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 6 (YE/LG) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <b>B2</b> .</p>
<b>B2 CHECK THE HORN RELAY FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Install a known good relay.</li> <li>• <b>Does the horn continue to sound?</b></li> </ul>	<p><b>Yes</b> REMOVE the known good relay. GO to <b>B3</b> .</p> <p><b>No</b> REMOVE the known good relay. INSTALL a new horn relay. TEST the system for normal operation.</p>
<b>B3 CHECK THE LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Connect: Horn Relay.</li> <li>• Disconnect: LCM C2145b.</li> <li>• <b>Does the horn continue to sound?</b></li> </ul>	<p><b>Yes</b> GO to <b>B4</b> .</p> <p><b>No</b> GO to <b>B7</b> .</p>
<b>B4 CHECK THE CLOCKSPring INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Depower the Supplemental Restraint System (SRS). Refer to <a href="#">Section 501-20B</a> .</li> <li>• Disconnect: Clockspring C218a.</li> <li>• Connect: Negative Battery Cable.</li> <li>• <b>Does the horn continue to sound?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 1 (DB) for a short to ground. REPOWER the SRS . REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> GO to <b>B5</b> .</p>
<b>B5 CHECK THE CLOCKSPring</b>	
<ul style="list-style-type: none"> <li>• Connect: Clockspring C218a.</li> <li>• Remove the driver side air bag module. Refer to <a href="#">Section 501-20B</a> .</li> <li>• Connect: Negative Battery Cable.</li> <li>• Disconnect: Clockspring C218b.</li> <li>• <b>Does the horn continue to sound?</b></li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. REFER to <a href="#">Section 501-20B</a> . TEST the system for normal operation.</p> <p><b>No</b> GO to <b>B6</b> .</p>
<b>B6 CHECK THE STEERING WHEEL HARNESS FOR SHORTS OR DAMAGE</b>	

<ul style="list-style-type: none"> <li>• Inspect the steering wheel harness for shorts or damage.</li> <li>• <b>Is the steering wheel harness OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new driver side air bag module. REFER to <u>Section 501-20B</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR or INSTALL a new steering wheel harness. REPOWER the SRS . REFER to <u>Section 501-20B</u> . TEST the system for normal operation.</p>
<b>B7 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**General Specifications**

Item	Specification
<b>Generator (Base Vehicle)</b>	
Generator pulley ratio	2.72:1
Rating	82 amps @ 500 rpm (min) - 140 amps @ 2,000 rpm (max)
Voltage regulator type	Electronic internal with generator
<b>Generator (Police Interceptor/Long Wheel Base (LWB) Taxi)</b>	
Generator pulley ratio	2.95:1
Rating	95 amps @ 500 rpm (min) - 195 amps @ 2,000 rpm (max)
Voltage regulator type	Electronic internal with generator

**Torque Specifications**

Description	Nm	lb-ft	lb-in
Engine cover nut	10	-	89
Generator B+ cable nut	12	-	106
Generator bolts	25	18	-
Generator bracket bolts	10	-	89
Generator radial adapter nut	10	-	89



**Charging System**

The charging system is a negative ground system consisting of:

- a generator with an internal voltage regulator.
- a charging system warning indicator.
- a battery.
- circuitry and cables.
- a PCM.
- a radial arm adapter (serviceable separately from the generator)

The generator is driven by the accessory drive belt. When the engine is started, the generator begins to generate AC which is internally converted to DC. The DC is controlled by the voltage regulator (located on the rear of the generator) and supplied to the battery. The PCM controls the voltage regulation set point, working with the generator internal voltage regulator over 2 control and communication circuits.

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**Principles of Operation**

The PCM-controlled charging system, or "Smart Charge" charging system, determines the optimal voltage set point for the charging system and communicates this information to the voltage regulator. The "Smart Charge" charging system is designed to set 1 of 5 DTCs anytime a charging system fault is present. All of the DTCs can set continuous faults, but not all DTCs will set as on-demand faults.

DTC	KOEO	KOER	Continuous
P0563	X	X	X
P0620			X
P0625		X	X
P0626		X	X
P065B			X

This system uses 2 communication lines between the PCM and the generator/voltage regulator. Both of these communication lines use Pulse-Width Modulation (PWM). The generator communication (GENCOM) line communicates the desired set point from the PCM to the voltage regulator. The generator monitor (GENMON) line communicates the generator load and error conditions to the PCM. The GENCOM command is only sent by the PCM when it is necessary to adjust the voltage set point. If the set point does not need to be changed, several seconds may elapse between PCM GENCOM commands. This normal operation will appear in the PID as occasional "bursts" of pulse-width commands. The third pin on the voltage regulator, the A circuit pin, is a circuit dedicated to monitor or sense battery voltage.

The PCM simultaneously controls and monitors the output of the generator. When the current consumption is high or the battery is discharged, the PCM will raise engine speed as needed to increase generator output. The generator charges the battery and at the same time supplies power for all of the electrical loads that are required. The battery is more effectively charged with a higher voltage when the battery is cold and a lower voltage when the battery is warm. The PCM is able to adjust the charging voltage according to the battery temperature by using a signal from the Intake Air Temperature (IAT) sensor. The PCM also uses other inputs to control charging system voltage such as the Vehicle Speed Sensor (VSS) and Engine Coolant Temperature (ECT). This means the voltage set point is calculated by the PCM and communicated to the voltage regulator by the GENCOM circuit based on the needs of the vehicle and the conditions.

The PCM turns off the generator during cranking to reduce the generator load and improve cranking speed. Once the engine starts, the PCM slowly increases generator output to desired voltage.

The PCM controls the charging system warning indicator by sending a message over the High Speed Controller Area Network (HS-CAN) to the Instrument Cluster (IC) to turn the charging system lamp ON or OFF.

On vehicles equipped with a message center, the PCM controls the charging system warning indicator by sending a message over the HS-CAN to the IC module. The IC module will then control charging system warning indication based on the message from the PCM. If equipped with a charging system warning indicator, the IC module will turn the indicator ON or OFF. If equipped with a message center, the IC module will display a CHECK CHARGING SYSTEM message. When the ignition is ON and the engine is OFF on vehicles equipped with a message center, the CHECK CHARGING SYSTEM message may not be displayed.

For information regarding the IC module and message center, refer to [Section 413-01](#).

Under certain circumstances, the charging system may have a concern, but still keep the battery charged and the vehicle running. GENCOM is normally used to initiate charging, but the generator may charge with a fault in this circuit. If the engine is operated at greater than 2,000 rpm momentarily, the generator may "self-excite" or start charging on its own. The charging system warning indicator is illuminated and/or CHECK CHARGING SYSTEM message is displayed, and the generator operates in a default mode (approximately 13.5 volts) until the engine is turned off. When the engine is restarted and the engine is operated at greater than 2,000 rpm momentarily, the generator may again self-excite and again the charging system warning indicator is illuminated and/or CHECK CHARGING SYSTEM message is displayed.

The PIDs and their associated descriptions used in charging system diagnosis are listed below:

### PID Chart


PID	Description	Normal Display	Associated Circuit Name	Connector-Pin, Circuit
GENMON	Generator monitor	Constant fluctuating percentage 3%-98%	Generator monitor (GENMON)	C102a-1, 1817 (YE)
GENCMD	Generator command	Fluctuating percentage or small intermittent bursts 3%-98%	Generator communication (GENCOM)	C102a-2, 1816 (YE/LB)
GENVDSD	Generator voltage desired	Voltage varies by vehicle needs - May be controlled by an output state control	-	-
GENFIL	Generator fault indicator lamp command/status	OFF charging system is OK	-	-
GENCMD_LF	Generator command line fault	NO FAULT if GENCOM circuit (GENCMD PID) is OK	-	-
GENMON_HZ	Generator monitor frequency	Frequency value	-	-
VPWR	Module supply voltage	Within 0.5 volt of battery voltage	-	-
RPM	Engine revolutions per minute	Engine rpm - May be controlled by an output state control	-	-





**Inspection And Verification**

## Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**⚠ WARNING:** Batteries contain sulfuric acid and produce explosive gases. Work in a well-ventilated area. Do not allow the battery to come in contact with flames, sparks or burning substances. Avoid contact with skin, eyes or clothing. Shield eyes when working near the battery to protect against possible splashing of acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes, then get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always lift a plastic-cased battery with a battery carrier or with hands on opposite corners. Excessive pressure on the battery end walls may cause acid to flow through the vent caps, resulting in personal injury and/or damage to the vehicle or battery.

**NOTICE:** Do not make jumper connections except as directed. Incorrect connections may damage the voltage regulator test terminals, fuses or fusible links.

**NOTICE:** Do not allow any metal object to come in contact with the generator housing and internal diode cooling fins. A short circuit may result and burn out the diodes.

**NOTE:** While carrying out any pinpoint test, disregard any DTCs set while following a specific pinpoint test. After the completion of a test, be sure to clear all DTCs in the PCM.

**NOTE:** All voltage measurements are referenced to the negative (-) battery post unless otherwise specified.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Battery</li> <li>• Front End Accessory Drive (FEAD) belt</li> <li>• Generator pulley</li> </ul>	<ul style="list-style-type: none"> <li>• Wiring, terminals or connectors</li> <li>• Cables</li> <li>• Battery</li> <li>• Generator</li> <li>• Fusible links</li> <li>• Fuses</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. Verify the battery condition. Refer to [Section 414-01](#).
5. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

6. **NOTE:** The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM.

If the scan tool does not communicate with the VCM :

- check the VCM connection to the vehicle.
  - check the scan tool connection to the VCM.
  - refer to [Section 418-00](#), No Power To The Scan Tool, to diagnose no power to the scan tool.
7. If the scan tool does not communicate with the vehicle:
    - verify the ignition is ON.
      - ◆ The air bag warning indicator prove-out (other indicators may NOT prove ignition is ON) confirms ignition ON. If ignition does not turn ON, refer to [Section 211-05](#) to diagnose no power in RUN.
    - refer to [Section 418-00](#) Inspection and Verification to establish a scan tool session (without the ignition ON).
    - verify the scan tool operation with a known good vehicle.
  8. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#).

**NOTE:** Use the Integrated Diagnostic System (IDS) feature that retrieves all Continuous Memory Diagnostic Trouble Codes (CMDTCs) from all modules at one time.

9. Retrieve CMDTCs from all modules.
10. **NOTE:** If no charging system DTCs are present, the charging system is operating correctly. If the charging system has a concern, it will usually set a charging system DTC.

If the DTCs retrieved are related to the concern, go to the [Diagnostic Trouble Code \(DTC\) Chart](#) in this section. For all other DTCs, refer to the Master DTC Chart in [Section 419-10](#) or Powertrain Control/Emissions Diagnosis (PC/ED) manual.

11. If no DTCs related to the concern are retrieved, go to the [Symptom Chart](#) in this section.



**Diagnostic Trouble Code (DTC) Chart**





<b>DTCs</b>	<b>Description</b>	<b>Source</b>	<b>Action</b>
P0563	System Voltage High	PCM	<u>GO to Pinpoint Test A</u> .
P0563	System Voltage High	Various Modules	<u>GO to Pinpoint Test A</u>
P0620	Generator Control Circuit	PCM	<u>GO to Pinpoint Test C</u> .
P0625	Generator Field Terminal Circuit Low	PCM	<u>GO to Pinpoint Test D</u> .
P0626	Generator Field Terminal Circuit High	PCM	<u>GO to Pinpoint Test D</u> .
P065B	Generator Control Circuit Range/Performance	PCM	<u>GO to Pinpoint Test E</u> .
All other DTCs	-	Various Modules	REFER to the Master DTC Chart in <u>Section 419-10</u> or the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If directed to this section from another section, GO to <u>Symptom Chart</u> in this section.

## Symptom Chart

Symptom Chart

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**Pinpoint Test****Special Tool(s)**

 ST3104-A	Backprobe Pins POM6411 or equivalent
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

**Pinpoint Test A: System Voltage High**

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

**NOTE:** DTC P0563, B1317 or B1676 can be set if the vehicle has been recently jump started, the battery has been recently charged or the battery has been discharged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if vehicle accessories have been operating for an extended period of time without the engine running.

**Normal Operation**

With the engine running, the charging system supplies voltage to the battery and the vehicle electrical system through the battery B+ cable. The voltage that is supplied to the vehicle electrical system is used for the operation of the various vehicle systems and modules. Many modules monitor this voltage and if it rises above a calibrated set point, a DTC will be set.

- DTC P0563 (Battery Voltage High) - If the module detects a voltage from the charging system higher than 15.2 volts this DTC will be set. This DTC will not be set in the PCM unless the vehicle speed is above 8 km/h (5 mph).

**This pinpoint test is intended to diagnose the following:**

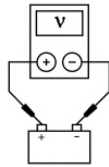
- Fuse
- Wiring, terminals or connectors
- Engine, generator and battery grounds
- Battery
- Generator
- PCM

**PINPOINT TEST A: SYSTEM VOLTAGE HIGH**

**NOTE:** Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.

**NOTE:** Do not have a battery charger attached during vehicle testing.

Test Step	Result / Action to Take
<b>A1 CHECK BATTERY CONDITION</b>	
<ul style="list-style-type: none"> <li>Refer to <u>Section 414-01</u> and carry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use.</li> <li><b>Does the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> INSTALL a new battery. REFER to <u>Section 414-01</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A2 CHECK FOR DTCs IN THE PCM</b>	
<ul style="list-style-type: none"> <li><b>NOTE:</b> Use the Integrated Diagnostic System (IDS) feature that retrieves all Continuous Memory Diagnostic Trouble Codes (CMDTCs) from all modules at one time.</li> <li>Retrieve CMDTCs from all modules.</li> <li><b>Do any charging system DTCs other than B1317, B1676 or P0563 exist?</b></li> </ul>	<p><b>Yes</b> REFER to the DTC Chart for the correct pinpoint test and DIAGNOSE those DTCs first.</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 MONITOR PCM PID GENERATOR VOLTAGE DESIRED (GENVDSD)</b>	
<ul style="list-style-type: none"> <li>Start the engine.</li> <li><b>NOTE:</b> Many of the PCM PIDs selected will be monitored later in this pinpoint test.</li> <li>Select and monitor the following PCM PIDs: <ul style="list-style-type: none"> <li>♦ Generator Monitor (GENMON)</li> <li>♦ Generator Command (GENCMD)</li> <li>♦ Generator Voltage Desired (GENVDSD)</li> <li>♦ Module Supply Voltage (VPWR)</li> </ul> </li> <li>Monitor the GENVDSD PID.</li> <li><b>Does the GENVDSD PID indicate 15.1 volts or less?</b></li> </ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A4 MONITOR PCM PID GENERATOR VOLTAGE DESIRED (GENVDSD)</b>	
<ul style="list-style-type: none"> <li>With the engine still running at idle, measure battery voltage and record.</li> </ul>	<p><b>Yes</b> The fault is not present at this time. This may indicate an intermittent fault. CARRY OUT a wiggle test on the charging system circuits to try and RECREATE the concern. CHECK generator connections for corrosion, loose connections and/or bent terminals. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>



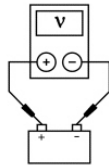
AJ0210-A

- Monitor the GENVDSD PID.
- Is battery voltage within  $\pm 0.6$  volts of the PID GENVDSD?

**No**  
GO to A5 .

#### A5 CHECK THE A SENSE VOLTAGE

- Ignition OFF.
- Disconnect: Generator C102A.
- Ignition ON.
- With ignition ON, measure battery voltage and record.



AJ0210-A

- Measure the voltage between generator C102A-3, circuit 35 (OG/LB), harness side and ground.
- Is the voltage equal to battery voltage?

**Yes**  
GO to A6 .

**No**  
VERIFY Battery Junction Box (BJB) fuse 6 (15A) is OK. If OK, REPAIR circuit 35 (OG/LB). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

#### A6 A SENSE CIRCUIT LOAD TEST

**NOTICE:** The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.

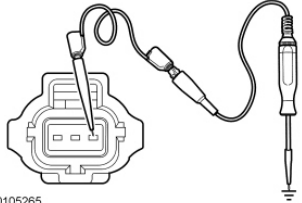
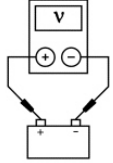
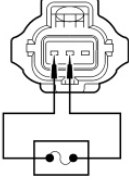
**NOTE:** This step puts a load on the A sense circuit. If there are corroded or loose connections, loading the circuit may help show the fault. A glass bulb style 12-volt test lamp is required for this step. This circuit will not be loaded properly using an LED-style test lamp.

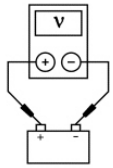
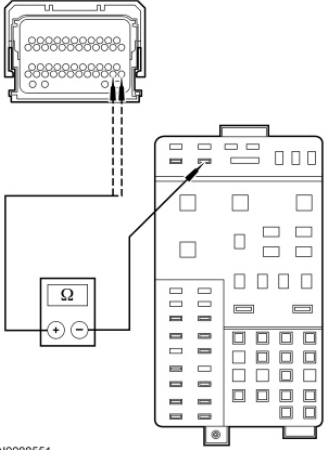
- Using a 12-volt test lamp connected to ground, check for voltage at generator C102A-3, circuit 35 (OG/LB), harness side.

**Yes**  
GO to A7 .

**No**  
REPAIR corroded or loose connection on circuit 35 (OG/LB). INSPECT generator C102A-3, circuit 35 (OG/LB) for damage. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.



 <p>N0105265</p> <p>• Does the test lamp illuminate?</p>	
<b>A7 CHECK THE GENERATOR OUTPUT</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Increase engine rpm until generator starts to generate output.</li> <li>• With the engine running, measure battery voltage and record.</li> </ul>  <p>AJ0210-A</p> <p>• Is the voltage above 14.5 volts?</p>	<p><b>Yes</b> INSTALL a new generator. REFER to <u>Generator</u> in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A8</u> .</p>
<b>A8 MONITOR PCM PIDs GENERATOR COMMAND (GENCMD), GENERATOR MONITOR (GENMON) AND GENERATOR VOLTAGE DESIRED (GENVDSD)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect a fused jumper wire between generator C102A-1, 1817 (YE), harness side and generator C102A-2, circuit 1816 (YE/LB), harness side.</li> </ul>  <p>N0074142</p> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Monitor the GENVDSD, GENMON and GENCMD PIDs.</li> <li>• Using the active command, set GENVDSD PID to 14 volts.</li> <li>• Does the GENCMD PID read within 2% of GENMON PID?</li> </ul>	<p><b>Yes</b> GO to <u>A9</u> .</p> <p><b>No</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A9 COMPARE PCM SUPPLY VOLTAGE (VPWR) PID</b>	

<ul style="list-style-type: none"> <li>With the engine still running at idle, measure the battery voltage at the battery and monitor the PCM VPWR PID.</li> </ul>  <p style="text-align: center;">AJ0210-A</p> <ul style="list-style-type: none"> <li>Does PCM VPWR PID accurately display battery voltage within <math>\pm 0.5</math> volt?</li> </ul>	<p><b>Yes</b> INSTALL a new generator. REFER to <u>Generator</u> in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A10</u> .</p>
<b>A10 CHECK PCM SUPPLY VOLTAGE CIRCUITS</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: PCM C175B.</li> <li>Disconnect: Fused Jumper Wire.</li> <li>Disconnect: BJB Fuse 20 (15A).</li> <li>Inspect the connector pins for damage. Measure resistance between C175B-35 circuit 361 (RD), PCM C175B-36 circuit 361 (RD), PCM power circuits and BJB fuse 20 (15A).</li> </ul>  <p style="text-align: center;">N0088551</p> <ul style="list-style-type: none"> <li>Are the resistances less than 0.5 ohm?</li> </ul>	<p><b>Yes</b> GO to <u>A11</u> .</p> <p><b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>A11 CHECK FOR CORRECT PCM OPERATION</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Check the PCM harness and component side connectors for: <ul style="list-style-type: none"> <li>corrosion.</li> <li>pushed-out/bent pins.</li> </ul> </li> <li>Connect the PCM and generator, make sure the connectors seat correctly.</li> <li>Operate the system and determine if the concern is still present.</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the</p>

<ul style="list-style-type: none"> <li>• <b>Is the concern still present?</b></li> </ul>	DTCs. REPEAT the self-test. TEST the system for normal operation.
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**Pinpoint Test B: System Voltage Low**

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

**NOTE:** DTC B1318 or B1676 can be set if the vehicle has been recently jump started, the battery has been recently charged or the battery has been discharged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if vehicle accessories have been operating for an extended period of time without the engine running.

**Normal Operation**

With the engine running, the charging system supplies voltage to the battery and the vehicle electrical system through the battery B+ cable. The voltage that is supplied to the vehicle electrical system is used for the operation of vehicle and the various modules. Many modules monitor this voltage and if it drops below a calibrated set point, a DTC will be set.

**This pinpoint test is intended to diagnose the following:**

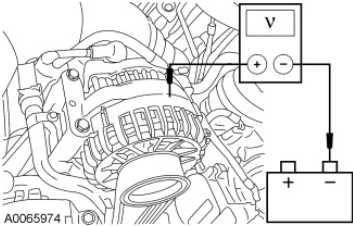
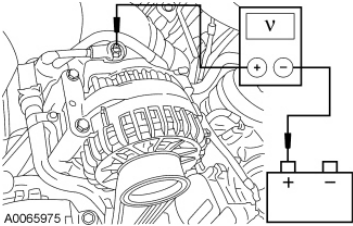
- Circuit high resistance
- Engine, generator and battery grounds
- Positive battery cable
- Battery
- High ignition-off current drain(s)
- Generator

**PINPOINT TEST B: SYSTEM VOLTAGE LOW**

**NOTE:** Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.

**NOTE:** Do not have a battery charger attached during vehicle testing.

Test Step	Result / Action to Take
<b>B1 CHECK THE BATTERY CONDITION</b>	
<ul style="list-style-type: none"> <li>• Refer to <u>Section 414-01</u> and carry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use. Refer to <u>Section 414-01</u> .</li> <li>• <b>Does the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> INSTALL a new battery. REFER to <u>Section 414-01</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>B2 CHECK THE VEHICLE GROUNDS</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• With the engine running at idle, headlamps on and heater blower on high, measure the voltage drop between the generator housing and the negative</li> </ul>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> INSPECT and REPAIR the engine ground, generator ground or the battery ground for corrosion. CLEAR</p>

<p>battery terminal.</p>  <p><b>• Is the voltage drop less than 0.25 volt (250 mV)?</b></p>	<p>the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>B3 CHECK THE VOLTAGE DROP IN THE B+ CIRCUIT 38 (RD)</b></p>	
<p><b>• With the engine running at idle, headlamps on and blower on high, measure the voltage drop between generator B+ C102B, circuit 38 (RD) and the positive battery terminal.</b></p>  <p><b>• Is the voltage drop less than 0.5 volt?</b></p>	<p><b>Yes</b> GO to <u>B4</u> .</p> <p><b>No</b> INSPECT and REPAIR any corrosion in the B+ 38 (RD) or positive battery cable connections. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>B4 CHECK FOR CURRENT DRAINS</b></p>	
<p><b>• Ignition OFF.</b></p> <p><b>• Carry out the Battery - Drain Testing component test. Refer to <u>Section 414-01</u> .</b></p> <p><b>• Are any circuits causing excessive current drains?</b></p>	<p><b>Yes</b> REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> The fault is not present at this time. CHECK with the customer to determine if any electrical system(s) may have been accidentally left on. If nothing unusual is found, CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. <u>GO to Pinpoint Test D</u> to continue diagnosis of the charging system.</p>

### Pinpoint Test C: DTC P0620

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

#### Normal Operation

The PCM monitors the generator output via the GENMON circuit. The PCM uses the GENCOM circuit to command the generator to either increase or decrease output. If the GENCOM circuit (generator control circuit) or the A sense circuit are open or shorted to ground, the PCM will be unable to control the generator

output. A GENMON circuit fault can be confirmed by viewing the PCM PID generator command line fault (GENCMD\_LF) (status would be Yes Fault). When the engine rises above approximately 2,000 rpm, the generator will default to a steady voltage of approximately 13.5 volts and the PCM will send a request to the Instrument Cluster (IC) to illuminate the charging system warning indicator lamp.

- DTC P0620 (Generator Control Circuit) - If the GENCOM circuit or A sense circuit are open or shorted to ground, the PCM will set this DTC.

**This pinpoint test is intended to diagnose the following:**

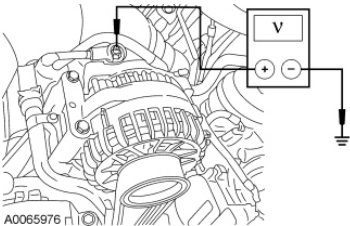
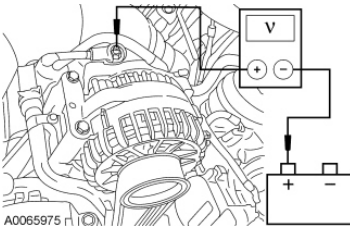
- Fuse
- Wiring, terminals or connectors
- Generator
- PCM

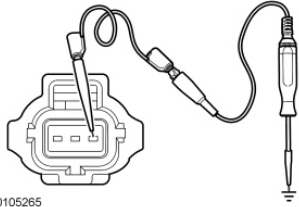
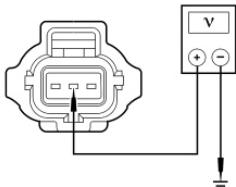
#### PINPOINT TEST C: DTC P0620

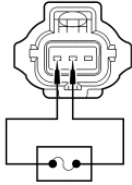
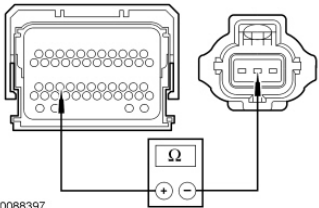
**NOTE:** Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.

**NOTE:** Do not have a battery charger attached during vehicle testing.

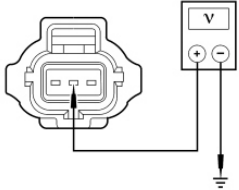
Test Step	Result / Action to Take
<b>C1 CHECK THE BATTERY CONDITION</b>	
<ul style="list-style-type: none"> <li>• Refer to <u>Section 414-01</u> and carry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use.</li> <li>• <b>Does the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> INSTALL a new battery. REFER to <u>Section 414-01</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>C2 CHECK THE GENERATOR B+ CONNECTION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Inspect generator C102A connection. The connector should be installed correctly and tight.</li> <li>• Disconnect: Generator C102A.</li> <li>• Inspect generator C102A for bent or pushed-out pins.</li> <li>• Inspect generator C102B, circuit 38 (RD). The connection should be tight.</li> <li>• Measure the battery voltage.</li> </ul> <div> </div> <p>AJ0210-A</p>	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> TIGHTEN the C102B nut as needed. REFER to Specifications in this section. VERIFY the fusible link is OK. If the fusible link is OK, REPAIR the circuit. If the fusible link is not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>

<ul style="list-style-type: none"> <li>• Measure the voltage between generator C102B, B+ circuit 38 (RD), harness side and ground.</li> </ul>  <p>A0065976</p> <ul style="list-style-type: none"> <li>• Is generator C102B connection tight and does the generator B+ measure battery voltage?</li> </ul>	
<b>C3 CHECK THE VOLTAGE DROP IN THE B+ CIRCUIT 38 (RD)</b>	
<ul style="list-style-type: none"> <li>• Connect: Generator C102A.</li> <li>• Start the engine.</li> <li>• With the engine running at idle, headlamps on and blower on high, measure the voltage drop between generator B+ C102B circuit 38 (RD) and the positive battery terminal.</li> </ul>  <p>A0065975</p> <ul style="list-style-type: none"> <li>• Is the voltage drop less than 0.5 volt?</li> </ul>	<p><b>Yes</b> GO to <b>C4</b> .</p> <p><b>No</b> INSPECT the circuit B+ 38 (RD) and the positive battery cable for loose connections, physical damage or wire corrosion. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>C4 A SENSE CIRCUIT LOAD TEST</b>	
<p><b>NOTICE:</b> The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.</p> <p><b>NOTE:</b> This step puts a load on the A sense circuit. If there are corroded or loose connections, loading the circuit may help show the fault. A glass bulb style test lamp is required for this step. This circuit will not be loaded properly using an LED-style test lamp.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Generator C102A.</li> <li>• Ignition ON.</li> </ul>	<p><b>Yes</b> GO to <b>C5</b> .</p> <p><b>No</b> VERIFY Battery Junction Box (BJB) fuse 6 (15A) is OK. If OK, REPAIR circuit 35 (OG/LB). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>

<ul style="list-style-type: none"> <li>Using a 12-volt test lamp connected to ground, check for voltage at generator C102A-3, circuit 35 (OG/LB) harness side.</li> </ul>  <p>N0105265</p> <ul style="list-style-type: none"> <li><b>Does the test lamp illuminate?</b></li> </ul>	
<b>C5 CHECK THE GENERATOR COMMAND LINE FAULT (GENCMD_LF) PID</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Generator C102A.</li> <li>Start the engine.</li> <li><b>NOTE:</b> Many of the PCM PIDs selected will be monitored later in this pinpoint test.</li> <li>Select and monitor the following PCM PIDs: <ul style="list-style-type: none"> <li>♦ Generator Monitor (GENMON)</li> <li>♦ Generator Command (GENCMD)</li> <li>♦ Generator Command Line Fault (GENCMD_LF)</li> </ul> </li> <li>With the engine still running at idle, monitor the GENCMD_LF PID.</li> <li><b>Does the GENMON_LF PID display a fault?</b></li> </ul>	<p><b>Yes</b> GO to <u>C6</u> .</p> <p><b>No</b> GO to <u>C9</u> .</p>
<b>C6 CHECK THE GENCOM CIRCUIT FOR A SHORT TO POWER</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Generator C102A.</li> <li>Ignition ON.</li> <li>Measure the voltage between generator C102A-2, circuit 1816 (YE/LB), harness side and ground.</li> </ul>  <p>N0087307</p> <ul style="list-style-type: none"> <li><b>Does voltage read 1 volt or less?</b></li> </ul>	<p><b>Yes</b> GO to <u>C7</u> .</p> <p><b>No</b> GO to <u>C11</u> .</p>
<b>C7 COMPARE THE PCM PIDs GENERATOR MONITOR (GENMON) AND GENERATOR COMMAND (GENCMD)</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect a fused jumper wire between generator C102A-1, circuit 1817 (YE), harness side and generator C102A-2, circuit 1816 (YE/LB), harness side.</li> </ul>  <p>N0074142</p> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Monitor the GENMON and GENCMD PIDs while performing a wiggle test on the generator harness.</li> <li>• <b>Does the GENMON PID read within 5% of the GENCMD PID?</b></li> </ul>	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b> GO to <u>C12</u> .</p>
<b>C8 CHECK CIRCUIT 1816 (YE/LB) FOR DAMAGE OR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Fused Jumper Wire.</li> <li>• Disconnect: PCM C175B.</li> <li>• Inspect the following harness connectors for damaged or pushed-out pins: <ul style="list-style-type: none"> <li>◆ PCM C175B-32, circuit 1816 (YE/LB).</li> <li>◆ Generator C102B-2, circuit 1816 (YE/LB).</li> </ul> </li> <li>• Measure the resistance between PCM C175B-32, circuit 1816 (YE/LB), harness side and generator C102A-2, circuit 1816 (YE/LB), harness side.</li> </ul>  <p>N0088397</p> <ul style="list-style-type: none"> <li>• <b>Are the connectors and pins free of damage and is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>C9</u> .</p> <p><b>No</b> REPAIR circuit 1816 (YE/LB). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>C9 CHECK CIRCUIT 1816 (YE/LB) FOR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Generator C102A (if not previously disconnected).</li> </ul>	<p><b>Yes</b> GO to <u>C10</u> .</p> <p><b>No</b> REPAIR circuit 1816 (YE/LB). CLEAR the</p>



<ul style="list-style-type: none"> <li>• Disconnect: PCM C175B (if not previously disconnected).</li> <li>• Measure the resistance between generator C102A-2, circuit 1816 (YE/LB), harness side and ground.</li> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	DTCs. REPEAT the self-test. TEST the system for normal operation.
<b>C10 CHECK THE CHARGING SYSTEM CIRCUITS FOR INTERMITTENT FAULTS</b>	
<ul style="list-style-type: none"> <li>• Connect: Generator C102A.</li> <li>• Connect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Clear all DTCs.</li> <li>• Start the engine and let the engine run for 5 minutes.</li> <li>• Retrieve Continuous Memory Diagnostic Trouble Codes (CMDTCs) from all modules.</li> <li>• <b>Did any charging system DTC get stored into memory?</b></li> </ul>	<p><b>Yes</b> INSTALL a new generator. REFER to <u>Generator</u> procedure in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> The fault is not present at this time. This may indicate an intermittent fault. CARRY OUT a wiggle test on the charging system circuits to try and RECREATE the concern. CHECK generator connections for corrosion, loose connections and/or bent terminals. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>C11 CHECK FOR SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between generator C102A-2, circuit 1816 (YE/LB), harness side and ground.</li> </ul>  <p><b>• Does voltage read 0 volt?</b></p>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 1816 (YE/LB). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>C12 INSPECT GENERATOR CIRCUITS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175B.</li> <li>• Inspect the following connector pins for damage and/or corrosion: <ul style="list-style-type: none"> <li>◆ PCM C175B-50, circuit 570 (BK/WH)</li> <li>◆ Generator C102A-1, circuit 1817 (YE)</li> <li>◆ Generator C102A-2, circuit 1816 (YE/LB)</li> </ul> </li> <li>• <b>Are the connectors OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> REPAIR high resistance or loose connections in the affected circuit(s). CLEAR the DTCs. REPEAT the self-test. TEST the system for</p>

**Pinpoint Test D: DTCs P0625 and P0626**

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

**Normal Operation**

The PCM monitors the generator output via the GENMON circuit (generator field terminal circuit). If the PCM cannot read the GENMON circuit due to an open or short to ground, when the engine rises above approximately 2,000 rpm, the generator will default to a steady voltage of approximately 13.5 volts and the PCM will send a request to the Instrument Cluster (IC) to illuminate the charging system warning indicator lamp. A GENMON duty cycle of 3% or less indicates a short to ground fault is present and will result in DTC P0625 setting in the PCM. A GENMON duty cycle of 98% or more indicates an open or short to voltage fault is present and will result in DTC P0626 setting in the PCM.

- DTC P0625 (Generator Field Terminal Circuit Low) - If the GENMON circuit is shorted to ground or the A sense is open, the PCM will set this DTC. This DTC can also be set by a faulted PCM or generator.
- DTC P0626 (Generator Field Terminal Circuit High) - If the GENMON circuit is open or shorted to power, the PCM will set this DTC. This DTC can also be set by a poor engine ground or faulted PCM or generator.

**This pinpoint test is intended to diagnose the following:**

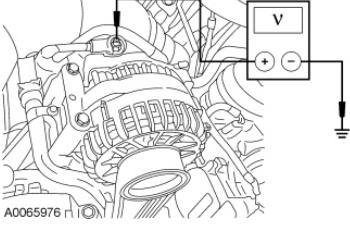
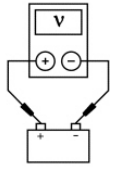
- Fuse
- Wiring, terminals or connectors
- Engine, generator and battery grounds
- Battery
- Generator
- PCM

**PINPOINT TEST D: DTCs P0625 AND P0626**

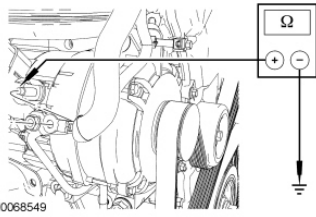
**NOTE:** Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.

**NOTE:** Do not have a battery charger attached during vehicle testing.

Test Step	Result / Action to Take
<b>D1 CHECK THE BATTERY CONDITION</b>	
<ul style="list-style-type: none"> <li>• Refer to <u>Section 414-01</u> and carry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use.</li> <li>• <b>Does the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> INSTALL a new battery. REFER to <u>Section 414-01</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>D2 CHECK THE GENERATOR B+ CONNECTION</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Inspect generator C102B, circuit 38 (RD), harness side. The connection should be tight.</li> <li>• Measure the voltage between generator C102B, circuit 38 (RD) and ground.</li> </ul>  <p>A0065976</p> <ul style="list-style-type: none"> <li>• <b>Is generator C102B connection tight and does the generator B+ measure battery voltage?</b></li> </ul>	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> TIGHTEN C102B nut as needed. REFER to Specifications in this section. VERIFY the fusible link is OK. If the fusible link is OK, REPAIR the circuit. If the fusible link is not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>D3 CHECK THE A SENSE VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Generator C102A.</li> <li>• Ignition ON.</li> <li>• Measure battery voltage and record.</li> </ul>  <p>AJ0210-A</p> <ul style="list-style-type: none"> <li>• Measure the voltage between generator C102A-3, circuit 35 (OG/LB), harness side and ground.</li> <li>• <b>Is the voltage equal to battery voltage?</b></li> </ul>	<p><b>Yes</b> GO to <u>D4</u> .</p> <p><b>No</b> VERIFY Battery Junction Box (BJB) fuse 6 (15A) is OK. If OK, REPAIR circuit 35 (OG/LB). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>D4 MONITOR THE PCM PID GENERATOR MONITOR (GENMON) WITH IGNITION ON/ENGINE OFF</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Generator C102A.</li> <li>• Ignition ON.</li> <li>• <b>NOTE:</b> Many of the PCM PIDs selected will be monitored later in this pinpoint test.</li> <li>• Select and monitor the following PCM PIDs: <ul style="list-style-type: none"> <li>◆ Generator Monitor (GENMON)</li> <li>◆ Generator Command (GENCMD)</li> <li>◆ Generator Voltage Desired (GENVDSD)</li> <li>◆ Engine Revolutions Per Minute (RPM)</li> <li>◆ Module Supply Voltage (VPWR)</li> </ul> </li> <li>• Monitor the GENMON PID.</li> <li>• <b>Does the GENMON PID read 0%?</b></li> </ul>	<p><b>Yes</b> GO to <u>D5</u> .</p> <p><b>No</b> GO to <u>D10</u> .</p>
<b>D5 MONITOR THE PCM PIDs GENERATOR MONITOR (GENMON) AND GENERATOR VOLTAGE DESIRED (GENVDSD) WITH ENGINE RUNNING AND NO LOADS</b>	

<ul style="list-style-type: none"> <li>• Start the engine and turn all electrical accessories (lights, blower motor) off.</li> <li>• With the engine at idle, wait at least 15 seconds for the GENVDSD PID to increase to greater than 13 volts.</li> <li>• Monitor PID GENMON at idle.</li> <li>• Increase the engine speed to 3,000 rpm.</li> <li>• Monitor PID GENMON at 3,000 rpm.</li> <li>• <b>Does the GENMON PID read between 3% and 98% at engine idle speed and at 3,000 rpm?</b></li> </ul>	<p><b>Yes</b> GO to <u>D6</u> .</p> <p><b>No</b> GO to <u>D11</u> .</p>
<b>D6 MONITOR THE PCM PIDs GENERATOR MONITOR (GENMON), GENERATOR VOLTAGE DESIRED (GENVDSD) WITH THE ENGINE AT IDLE LOADS ON</b>	
<ul style="list-style-type: none"> <li>• Decrease the engine speed to 500 rpm using active command PID RPM and monitor PIDs.</li> <li>• <b>NOTE:</b> On vehicles with low electrical loads, it is necessary to make sure that all of the vehicle's electrical loads are turned on to determine the maximum GENMON PID value. The GENMON PID value may not reach between the desired 95%-98% on a low load vehicle with minimal electrical accessories. As long as the GENMON PID increases significantly with all of the electrical loads on, answer YES to the question below.</li> <li>• Determine the maximum GENMON PID value by lowering engine idle rpm to 500 rpm or less using output state control PID RPM and turn on all electrical accessories until the module supply voltage (VPWR) PID is less than the GENVDSD PID by at least 0.7 volt. Under this condition the GENMON PID should read between 95% and 98%.</li> <li>• <b>Does the GENMON PID read between 95% and 98%?</b></li> </ul>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> GO to <u>D11</u> .</p>
<b>D7 MONITOR THE PCM PIDs GENERATOR MONITOR (GENMON), MODULE SUPPLY VOLTAGE (VPWR) AND GENERATOR VOLTAGE DESIRED (GENVDSD) WITH THE ENGINE AT 3,000 RPM</b>	
<ul style="list-style-type: none"> <li>• Increase the engine speed to 3,000 rpm and monitor PIDs.</li> <li>• <b>NOTE:</b> If GENMON PID does not remain below 85%, make sure that the battery is at an acceptable state of charge and that all electrical accessories are off.</li> <li>• Monitor PIDs VPWR, GENVDSD and GENMON.</li> <li>• <b>Does the VPWR PID remain within <math>\pm 0.5</math> volt of the GENVDSD PID when the GENMON PID is less than 85%?</b></li> </ul>	<p><b>Yes</b> GO to <u>D8</u> .</p> <p><b>No</b> GO to <u>D11</u> .</p>
<b>D8 CHECK THE GENERATOR B+ RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>NOTE:</b> Failure to disconnect the battery will result in false resistance readings.</li> <li>• Disconnect the battery. Refer to <u>Section 414-01</u> .</li> <li>• Disconnect: Generator C102B.</li> <li>• Measure the resistance between generator C102B, component side and the generator housing.</li> </ul>	<p><b>Yes</b> GO to <u>D9</u> .</p> <p><b>No</b> INSTALL a new generator. REFER to <u>Generator</u> in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>



- Is the resistance greater than 10K ohms?

#### D9 CHECK THE RESISTANCE OF THE VOLTAGE REGULATOR INTERNAL CIRCUITS TO GROUND

- Disconnect: Generator C102A.
- Measure the resistance between generator C102A, component side and ground. Refer to the following table.

Pin	Expected Resistance
1	Greater than 10K ohms
2	Greater than 10K ohms
3	Greater than 10K ohms

- Are the resistance values as indicated?

#### Yes

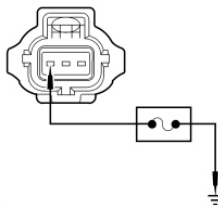
The fault is not present at this time. This may indicate an intermittent fault. CARRY OUT a wiggle test on the charging system circuits to try and RECREATE the concern. CHECK generator connections for corrosion, loose connections and/or bent terminals. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

#### No

INSTALL a new generator. REFER to Generator in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.

#### D10 CHECK THE PCM PID GENERATOR MONITOR (GENMON) INPUT TO THE PCM

- Ignition OFF.
- Disconnect: Generator C102A.
- Connect a fused jumper wire between generator C102A-1, circuit 1817 (YE), harness side and ground.



- Ignition ON.
- Monitor the GENMON PID while performing a wiggle test on the generator wiring harness.
- Does the GENMON PID read 0%?

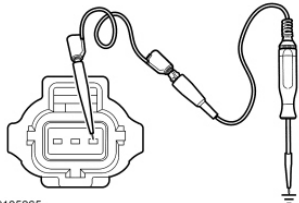
#### Yes

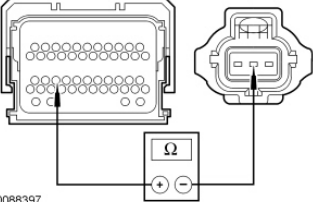
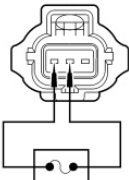
GO to D14.

#### No

GO to D15.

#### D11 A SENSE CIRCUIT LOAD TEST

<p><b>NOTICE:</b> The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.</p> <p><b>NOTE:</b> This step puts a load on the A sense circuit. If there are corroded or loose connections, loading the circuit may help show the fault. A glass bulb style test lamp is required for this step. This circuit will not be loaded properly using an LED-style test lamp.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Generator C102A.</li> <li>• Ignition ON.</li> <li>• Using a 12-volt test lamp connected to ground, check for voltage at C102A-3, circuit 35 (OG/LB), harness side.</li> </ul>  <p>• Does the test lamp illuminate?</p>	<p><b>Yes</b> GO to <u>D12</u> .</p> <p><b>No</b> VERIFY BJB fuse 6 (15A) is OK. If OK, REPAIR circuit 35 (OG/LB). If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>D12 B+ CIRCUIT LOAD TEST</b></p>	
<p><b>NOTICE:</b> The following step uses a test light to simulate normal circuit loads. Use only the test light recommended in the Special Tools table at the beginning of this section. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.</p> <p><b>NOTE:</b> This step puts a load on the B+ circuit. If there are corroded or loose connections, loading the circuit may help show the fault. A glass bulb style test lamp is required for this step. This circuit will not be loaded properly using an LED-style test lamp.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Generator C102B.</li> <li>• Using a 12-volt test lamp connected to ground, check for voltage at C102B-1, circuit 38 (RD), harness side.</li> <li>• Does the test lamp illuminate?</li> </ul>	<p><b>Yes</b> GO to <u>D13</u> .</p> <p><b>No</b> REPAIR circuit 38 (RD) for high resistance. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<p><b>D13 CHECK CIRCUIT 1816 (YE/LB) FOR DAMAGE OR AN OPEN</b></p>	

<ul style="list-style-type: none"> <li>• Disconnect: PCM C175B.</li> <li>• Inspect the following harness connectors for damaged or pushed-out pins: <ul style="list-style-type: none"> <li>♦ PCM C175B-32, circuit 1816 (YE/LB).</li> <li>♦ Generator C102A-2, circuit 1816 (YE/LB).</li> </ul> </li> </ul>  <p>N0088397</p> <ul style="list-style-type: none"> <li>• Measure the resistance between PCM C175B-32, circuit 1816 (YE/LB), harness side and generator C102A-2, circuit 1816 (YE/LB), harness side.</li> <li>• <b>Are the connectors and pins free of damage and is the resistance less than 0.5 ohm?</b></li> </ul>	<p><b>Yes</b> GO to <b>D14</b> .</p> <p><b>No</b> REPAIR circuit 1816 (YE/LB). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>D14 COMPARE THE PCM PIDs GENERATOR MONITOR (GENMON) AND GENERATOR COMMAND (GENCMD)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Generator C102B (if previously disconnected).</li> <li>• Connect: PCM C175B (if previously disconnected).</li> <li>• Connect a fused jumper wire between generator C102A-1, circuit 1817 (YE), harness side and generator C102A-2, circuit 1816 (YE/LB), harness side.</li> </ul>  <p>N0074142</p> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• Using the active command, set the GENVDSD PID to 14.0 volts.</li> <li>• Monitor the GENMON and GENCMD PIDs while performing a wiggle test on the generator wiring harness.</li> <li>• <b>Does the GENMON PID read within 2% of the GENCMD PID?</b></li> </ul>	<p><b>Yes</b> INSTALL a new generator. REFER to <b>Generator</b> in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> GO to <b>D16</b> .</p>
<b>D15 INSPECT GENERATOR CIRCUITS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175E.</li> <li>• Inspect the following connector pins for damage and/or corrosion, generator C102A-1 circuit 1817 (YE) and PCM C175E-5.</li> <li>• <b>Are the connectors OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <b>Section 303-14</b> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b></p>

	REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal
<b>D16 INSPECT PCM CIRCUITS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Fused Jumper Wire.</li> <li>• Disconnect: PCM C175B.</li> <li>• Disconnect: PCM C175E.</li> <li>• Inspect the following connector pins for damage and/or corrosion: <ul style="list-style-type: none"> <li>◆ PCM C175E-5, circuit 1817 (YE)</li> <li>◆ PCM C175B-32, circuit 1816 (YE/LB)</li> <li>◆ Generator C102A-1, circuit 1817 (YE)</li> <li>◆ Generator C102A-2, circuit 1816 (YE/LB)</li> </ul> </li> <li>• <b>Are the connectors OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test. TEST the system for normal</p>

**Pinpoint Test E: DTC P065B**

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

**Normal Operation**

With the engine running, the PCM expects to receive a valid generator monitor (GENMON) signal with a duty cycle greater than 5% and less than 98%. The PCM also monitors the state of the generator command (GENCMD) signal line to make sure it is not stuck high or stuck low. If the GENCMD or GENMON signal fluctuates between out-of-valid range, stuck high, stuck low or some combination and normal, a DTC will set. When the engine rises above approximately 2,000 rpm, the generator will default to a steady voltage of approximately 13.5 volts and the PCM will send a request to the Instrument Cluster (IC) to illuminate the charging system warning indicator lamp.

- DTC P065B (Generator Control Circuit Range/Performance) - If the input frequency was continuously less than 80 Hz or more than 200 Hz the PCM will set this DTC. Additionally, if the signal shows a faulted condition that is happening in a fluctuating manner, the PCM will track the fluctuations between faulted and normal conditions. If the fluctuations occur frequently within a short amount of time, this DTC will also be set.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Generator
- PCM

**PINPOINT TEST E: DTC P065B - GENERATOR CONTROL CIRCUIT RANGE/PERFORMANCE**

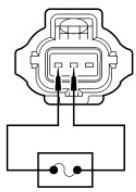
**NOTE:** Make sure battery voltage is greater than 12.2 volts prior to carrying out this pinpoint test.

**NOTE:** Do not have a battery charger attached during vehicle testing.

Test Step	Result / Action to Take
<b>E1 CHECK THE BATTERY CONDITION</b>	



<ul style="list-style-type: none"> <li>• Refer to <u>Section 414-01</u> and carry out Pinpoint Test A: Battery Condition Test to determine if the battery can hold a charge and is OK for use. Refer to <u>Section 414-01</u>.</li> <li>• <b>Does the battery pass the condition test?</b></li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> INSTALL a new battery. REFER to <u>Section 414-01</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>E2 CHECK THE PCM GENERATOR MONITOR FREQUENCY (GENMON_HZ) PID</b>	
<ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• <b>NOTE:</b> Many of the PCM PIDs selected will be monitored later in this pinpoint test.</li> <li>• Select and monitor the following PCM PIDs: <ul style="list-style-type: none"> <li>◆ Generator Voltage Desired (GENVDSD)</li> <li>◆ Generator Monitor Frequency (GENMON_HZ)</li> </ul> </li> <li>• Monitor the GENMON_HZ PID.</li> <li>• <b>Is the PID below 80 Hz or above 200 Hz?</b></li> </ul>	<p><b>Yes</b> GO to <u>E3</u> .</p> <p><b>No</b> The fault is not present at this time. This may indicate an intermittent fault. CARRY OUT a wiggle test on the charging system circuits to try and RECREATE the concern. CHECK generator connections for corrosion, loose connections and/or bent terminals. REPAIR as necessary. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>
<b>E3 CHECK THE PCM GENERATOR MONITOR FREQUENCY (GENMON_HZ) PID WITH GENERATOR C102A DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Generator C102A.</li> <li>• Start the engine.</li> <li>• Monitor the GENMON_HZ PID.</li> <li>• <b>Does the PID read between 0-2 Hz?</b></li> </ul>	<p><b>Yes</b> GO to <u>E5</u> .</p> <p><b>No</b> GO to <u>E4</u> .</p>
<b>E4 CHECK GENERATOR CIRCUITRY</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• <b>NOTICE:</b> This pinpoint test step directs testing circuits using a back-probe method. Use the special back-probe tool specified in the tool list in this section. Do not force test leads or other probes into connectors. Adequate care must be exercised to avoid connector terminal damage while ensuring that good electrical contact is made with the circuit or terminal. Failure to follow these instructions may cause damage to wiring, terminals or connectors and subsequent electrical faults.</li> <li>• With the PCM connected, connect a fused jumper wire between PCM C175E-5, circuit 1817 (YE) and ground by carefully back probing the PCM.</li> <li>• Start the engine.</li> <li>• Monitor the GENMON_HZ PID.</li> <li>• <b>Does the PID read 0 Hz?</b></li> </ul>	<p><b>Yes</b> INSPECT the harness for wire-to-wire shorts or insulation chaffing, mis-pinned connectors and correct wire colors and REPAIR generator circuit 1817 (YE) as needed. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>

<b>E5 MONITOR THE PCM PID GENERATOR MONITOR FREQUENCY (GENMON_HZ) WHILE ACTIVATING THE GENERATOR VOLTAGE DESIRED (GENVDSD) PID</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect a fused jumper wire between generator C102A-1, circuit 1817 (YE), harness side and generator C102A-2, circuit 1816 (YE/LB), harness side.</li> </ul>  <p style="text-align: center;">N0074142</p> <ul style="list-style-type: none"> <li>• Start the engine.</li> <li>• With the engine at idle, set the output state control GENVDSD PID to 14 volts.</li> <li>• Monitor the GENMON_HZ PID.</li> <li>• <b>Does the GENMON_HZ PID read between 120-130 Hz?</b></li> </ul>	<p><b>Yes</b> INSTALL a new generator. REFER to <u>Generator</u> in this section. CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation.</p>

### Pinpoint Test F: The Generator is Noisy

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

#### Normal Operation

The generator is belt-driven by the engine accessory drive system. There are 2 sources of generator noise: bearing noise and electrical fault noise. A generator with certain types of diode or stator failures may also produce an audible noise.

#### This pinpoint test is intended to diagnose the following:

- Accessory drive belt
- Loose bolts/brackets
- Generator/pulley

### PINPOINT TEST F: THE GENERATOR IS NOISY

Test Step	Result / Action to Take
<b>F1 CHECK FOR ACCESSORY DRIVE BELT NOISE AND LOOSE MOUNTING BRACKETS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the accessory drive belt and tensioner for damage and correct installation. Refer to <u>Section 303-05</u> .</li> </ul>	<p><b>Yes</b> GO to <u>F2</u> .</p> <p><b>No</b> REPAIR as necessary. REFER to <u>Section</u></p>

<ul style="list-style-type: none"> <li>• Check the accessory mounting brackets and generator pulley for looseness or misalignment.</li> <li>• <b>Is the accessory drive OK?</b></li> </ul>	<u>303-05</u> for diagnosis and testing of the accessory drive system. TEST the system for normal operation.
<b>F2 CHECK THE GENERATOR MOUNTING</b>	
<ul style="list-style-type: none"> <li>• Check the generator mounting for loose bolts or misalignment.</li> <li>• <b>Is the generator mounted correctly?</b></li> </ul>	<b>Yes</b> GO to <u>F3</u> .  <b>No</b> REPAIR as necessary. TEST the system for normal operation.
<b>F3 CHECK THE GENERATOR FOR NOISE</b>	
<ul style="list-style-type: none"> <li>• With the engine running, use a stethoscope or equivalent listening device to probe the generator and the accessory drive area for unusual mechanical noise.</li> <li>• <b>Is the generator the noise source?</b></li> </ul>	<b>Yes</b> INSTALL a new generator. REFER to the <u>Generator</u> procedure in this section.  <b>No</b> REFER to <u>Section 303-00</u> to diagnose the source of the engine noise.

**Pinpoint Test G: Radio Interference**

Refer to Wiring Diagrams Cell 12 , Charging System for schematic and connector information.

**Normal Operation**

The generator radio suppression equipment reduces interference transmitted through the speakers by the vehicle electrical system.

**This pinpoint test is intended to diagnose the following:**

- Generator
- Wiring, terminals or connectors
- In-vehicle entertainment system

**PINPOINT TEST G: RADIO INTERFERENCE**

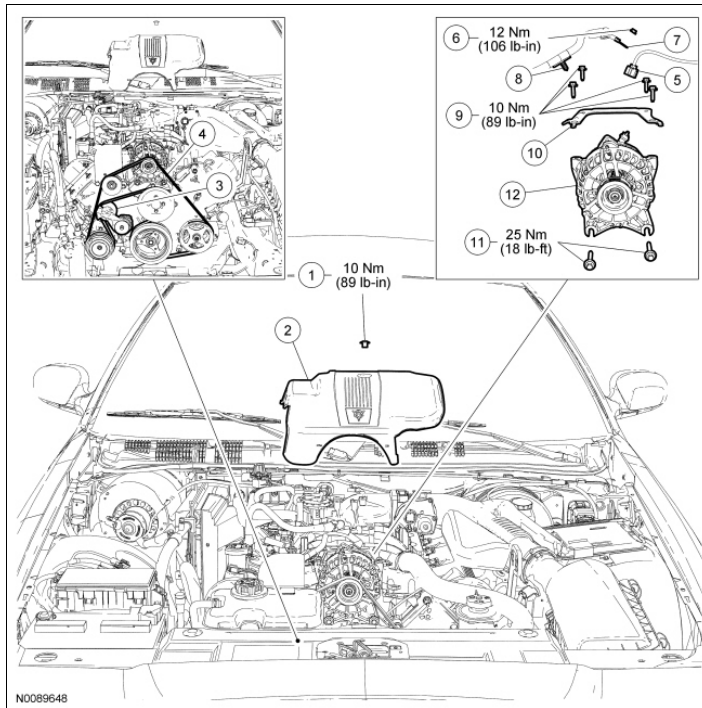
**NOTE:** If the OEM audio unit has been replaced with an aftermarket unit, the vehicle may not pass this test. Return the vehicle to OEM condition before following this pinpoint test.

**NOTE:** If the engine is operated at greater than 2,000 rpm momentarily, the generator will self-excite. Make sure when the generator is disconnected the engine rpm stays below 2,000 rpm. If it does rise above 2,000 rpm, turn the ignition to the off position and start the test over again.

**NOTE:** Inspect for any aftermarket accessories that have been added to the vehicle. Check the wiring for these accessories and be sure they have not been attached to the generator circuits and are positioned away from the generator wiring.

Test Step	Result / Action to Take
<b>G1 VERIFY THE GENERATOR IS THE SOURCE OF THE RADIO INTERFERENCE</b>	

<ul style="list-style-type: none"> <li>• Start the engine and allow the engine to idle.</li> <li>• Tune the audio unit to a station where the interference is present.</li> <li>• Ignition OFF.</li> <li>• Disconnect: Generator C102B.</li> <li>• Start the engine and allow the engine to idle, determine if the interference is still present.</li> <li>• <b>Is the interference present with the generator disconnected?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 415-00</u> for diagnosis and testing of the in-vehicle entertainment system.</p> <p><b>No</b> INSTALL a new generator. REFER to <u>Generator</u> in this section. TEST the system for normal operation.</p>
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**Generator**

Item	Part Number	Description
1	N808455	Engine cover nut
2	6A946	Engine cover
3	6B209	Accessory drive belt tensioner
4	8620	Accessory drive belt
5	-	Generator electrical connector (part of 12B637)
6	W711953	Generator B+ terminal nut (police and Long Wheel Base (LWB) taxi)
7	-	Generator B+ terminal (part of 14B060)
8	-	Generator harness locator (part of 14B060)
9	N606676	Generator bracket bolts (4 required)
10	10153	Generator bracket
11	N806200	Generator bolts (2 required)
12	10346	Generator

**Removal and Installation**

1. Disconnect the battery. For additional information, refer to [Section 414-01](#).
2. Remove the nut and the engine cover.
  - To install, tighten to 10 Nm (89 lb-in).
3. Rotate the accessory drive belt tensioner clockwise and position the accessory drive belt aside.
4. Disconnect the generator electrical connector.

5. Position the protective boot aside, remove the nut and position the generator B+ terminal aside.
    - To install, tighten to 12 Nm (106 lb-in).
  6. Remove the battery cable harness pushpin from the generator bracket.
  7. Remove the 4 bolts and the generator bracket.
    - To install, tighten to 10 Nm (89 lb-in).
  8. Remove the 2 bolts and the generator.
    - To install, tighten to 25 Nm (18 lb-ft).
  9. If necessary, remove the cap, nut and the radial adapter.
    - To install, tighten to 10 Nm (89 lb-in).
  10. To install, reverse the removal procedure.
-

**General Specifications**

Item	Specification
Cold Cranking Amps (CCA) measured at -18°C (0°F)	650 CCA (standard)  750 CCA (optional)
Voltage	12 volt

**Torque Specifications**

Description	Nm	lb-in
Battery cable body ground terminal bolt	12	106
Battery cable engine ground terminal nut	12	106
Battery cable terminal bolts	6	53
Battery hold-down clamp bolt	5	44
Battery Junction Box (BJB) cable terminal nut	12	106
Battery tray-to-apron shield bolt	4	35
Battery tray bolts-to-radiator support and fender apron	12	106
Engine cover nut	10	89
Generator B+ terminal nut	12	106
Starter solenoid positive terminal nut	12	106
Starter solenoid wire terminal nut	6	53

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## Battery and Cables

Vehicles are equipped with a 12-volt, maintenance-free battery.

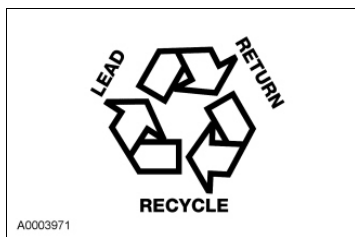
The battery and cable system consists of the following components:

- Battery
- Battery cable assembly
- Battery tray

The battery is a 12V DC source connected in a negative ground system. The battery case is sealed with 2 vent holes to release gases. The battery has 3 major functions:

- Engine cranking power source
- Voltage stabilizer for the electrical system
- Temporary power source when electrical loads exceed the generator output current

Ford Motor Company strongly recommends that lead-acid batteries be returned to an authorized recycling facility for disposal.



## Principles of Operation

### Battery Eye Operation

The battery eye indicates the state-of-charge of the battery by responding to the specific gravity of a single battery cell electrolyte. The battery eye has a viewing plate, 2 colored balls of different specific gravity and a small passage. As the state-of-charge and specific gravity changes, the balls change their position in the passageway and subsequently display a different color in the viewing eye. The primary purpose of the battery is to be a quick indicator of state-of-charge for assembly plants and dealership pre-delivery processes.

The color of the battery eye indicates the approximate state-of-charge.

- Red - indicates low state-of-charge.
- Yellow/Black - indicates between high and low state-of-charge.
- Green - indicates high state-of-charge.
- No color can occur after the battery has been in service for several years and some of the plate material has coated the balls.
- A clear battery eye can occur if the battery case becomes damaged and the electrolyte has fallen below the plates.

**NOTE:** The battery eye may remain red for a period of time (up to several days), even after the battery is fully charged, because the acid is not yet fully mixed.

Do not install a new battery based solely on the indication of the battery eye. The battery eye color simply indicates the battery state-of-charge, not its condition. For example, a red or yellow/black battery eye usually indicates the battery is discharged, not defective. If the battery eye indicates the battery may be discharged, it is necessary to recharge the battery before testing its condition.

### Charging a Battery

Batteries discharge while the vehicle is on the dealer lot or parked by the customer for an extended period of time due to normal parasitic key-off loads. Also, vehicles still in dealer inventory or in long-term storage may be driven short distances with heavy electrical loads. Over a period of time (30 days or more), this could result in vehicles having shallow or deeply discharged batteries.

- Deeply discharged - A battery that is drained over a prolonged period of time, such as an unsold vehicle or a vehicle in storage, to the point the battery is dead.
- Shallow discharge - A battery that is drained by leaving an accessory on for several hours or a few days and has a very low charge.

The vehicle charging system is designed to supply the electrical power needed to maintain the battery near full charge during normal vehicle use. The charging system is not capable of bringing a deeply discharged battery back to near full charge in a short amount of time such as allowing the vehicle to idle for 15 minutes to "recharge the battery". Discharged batteries should be charged using an external charger.

**NOTE:** Battery chargers have improved greatly with the addition of the new generation pulse chargers. These chargers pulse current into the battery, breaking down the sulfation layer on the battery plates and generally reduce charging times to less than an hour.

**NOTE:** Cold batteries will not readily accept a charge. Therefore, batteries should be allowed to warm to approximately 5°C (41°F) before charging. This may require 4 to 8 hours at room temperature.

The following chart summarizes 2 recommended methods of charging.

<b>Type of Battery Discharge</b>	<b>Pulse Charger</b>	<b>Standard Charger</b>
Deeply discharged	Follow directions supplied with the pulse charger	2 to 8 hours and may take up to an hour to accept initial charge
Shallow discharge	45 minutes to an hour charge	2 hours below (40A) on manual setting or medium automatic setting

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**Inspection And Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.


**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"><li>• Battery</li><li>• Battery mounting</li></ul>	<ul style="list-style-type: none"><li>• Battery cables</li><li>• Battery posts</li></ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
  4. If the fault is not visually evident, GO to Pinpoint Test A in the Pinpoint Test procedure.
-

**Pinpoint Test**

Special Tool(s)

 ST3285-A	GR 1 190 V3.0 Intelligent Diagnostic Charger 162-00036 or equivalent
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**Pinpoint Test A: Battery Condition Test****Normal Operation**

Battery condition is determined by measuring battery terminal voltage after a specific discharge current is applied for a specified time period.

**This pinpoint test is intended to diagnose the following:**

- Battery charge
- Battery

**PINPOINT TEST A: BATTERY CONDITION TEST**

Test Step	Result / Action to Take
<b>A1 TEST THE BATTERY CONDITION</b>	
<p><b>NOTE:</b> A red test-eye indicates the battery is discharged, not necessarily defective.</p> <p><b>NOTE:</b> Failure to fully charge the battery before retesting may cause false readings.</p> <ul style="list-style-type: none"> <li>• Verify the battery condition using the Intelligent Diagnostic Charger.</li> <li>• <b>Is the battery OK?</b></li> </ul>	<p><b>Yes</b> RETURN the battery to service.</p> <p><b>No</b> If the analyzer reads REPLACE BATTERY or REPLACE-BAD CELL, INSTALL a new battery. REFER to <u>Battery</u> in this section.</p>



## Component Test

### Battery - Drain Tests

**⚠ WARNING:** Batteries contain sulfuric acid and produce explosive gases. Work in a well-ventilated area. Do not allow the battery to come in contact with flames, sparks or burning substances. Avoid contact with skin, eyes or clothing. Shield eyes when working near the battery to protect against possible splashing of acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes, then get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in serious personal injury.

**NOTICE:** To prevent damage to the meter, do not crank the engine or operate accessories that draw more than 10A.

**NOTE:** No factory-equipped vehicle should have more than a 50 mA (0.050 amp) draw.

Check for current drains on the battery in excess of 50 mA (0.050 amp) with all the electrical accessories off and the vehicle at rest for at least 40 minutes. Current drains can be tested with the following procedure.

**NOTE:** Many electronic modules draw 10 mA (0.010 amp) or more continuously.

**NOTE:** Typically, a drain of approximately 1 amp is attributed to an engine compartment lamp, glove compartment lamp or interior lamp staying on continually. Other component failures or wiring shorts are located by selectively pulling fuses to pinpoint the location of the current drain. When the current drain is found, the meter reading falls to an acceptable level. If the drain is still not located after checking all the fuses, it may be due to the generator. Disconnect the generator and retest.

**NOTE:** To accurately test the drain on a battery, an in-line ammeter must be used between the negative battery post and its respective cable. Use of a test lamp or voltmeter is not an accurate method.

1. Drive the vehicle at least 5 minutes and over 48 km/h (30 mph) to turn on and activate the vehicle systems.
2. After driving the vehicle and before testing, make sure the junction box(es)/fuse panel(s) is accessible without turning on the interior lights or the underhood lights.
3. Allow the vehicle to sit with the key out of the ignition for at least 40 minutes to allow the modules to time out/power down.
4. Connect a fused jumper wire (30A) between the negative battery cable and the negative battery post to prevent modules from resetting.
5. Disconnect the negative battery cable from the negative battery post without breaking the connection of the jumper wire.
6. **NOTE:** It is very important that continuity is not broken between the battery and the negative battery cable when connecting the meter. If this happens, the entire 40-minute procedure must be repeated.

Connect the battery tester between the negative battery cable and the post. The meter must be capable of reading milliamps and should have a 10-amp capability.

7. **NOTE:** If the meter settings need to be switched or the test leads need to be moved to another jack, the jumper wire must be reinstalled to avoid breaking continuity.

Remove the jumper wire.

8. Note the amperage draw. Draw varies from vehicle to vehicle depending on the equipment package. Compare to a similar vehicle for reference.

**NOTE:** If the vehicle sits for an extended period of time and the battery drains, there is the possibility of a control module staying alive and not going into sleep mode. If a module does stay alive, it can also result in battery drain. If a module is suspect, isolate individual modules by disconnecting each module one at a time and note if the excessive draw goes away.

**NOTE:** For vehicles equipped with aftermarket bodies or boxes which contain electrical connections, disconnect the aftermarket to factory connections to isolate the body from the chassis.

9. If the current draw is excessive, remove the fuses from the Battery Junction Box (BJB) one at a time and note the current drop. When the current level drops to an acceptable level after removing a fuse, the circuit containing the excessive draw has been located. The excessive draw can be isolated by continuing to pull sub system fuses. Do not reinstall the fuses until testing is finished. To correctly isolate each of the circuits, all of the fuses may need to be removed, then install one fuse and note the amperage draw, remove the fuse and install the next fuse. Continue this process with each fuse.
- Once the main circuit is identified, continue to remove the fuses from the Smart Junction Box (SJB) one at a time and note the current reading. Do not reinstall the fuses until testing is finished. To correctly isolate each of the circuits, all of the fuses may need to be removed, then install one fuse and note the amperage draw, remove the fuse and install the next fuse. Continue this process with each fuse.
10. Check the wiring diagrams for any circuits that run from the battery without passing through the BJB or the SJB . If the current draw is still excessive, disconnect these circuits until the draw is found. Also, disconnect the generator electrical connections and retest if the draw cannot be located. The generator may be internally shorted, causing the current drain.
-





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**Battery Disconnect**

**⚠ WARNING:** Batteries contain sulfuric acid and produce explosive gases. Work in a well-ventilated area. Do not allow the battery to come in contact with flames, sparks or burning substances. Avoid contact with skin, eyes or clothing. Shield eyes when working near the battery to protect against possible splashing of acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes, then get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always deplete the backup power supply before repairing or installing any new front or side air bag supplemental restraint system (SRS) component and before servicing, removing, installing, adjusting or striking components near the front or side impact sensors or the restraints control module (RCM). Nearby components include doors, instrument panel, console, door latches, strikers, seats and hood latches. Refer to the Description and Operation portion of **Section 501-20B** for location of the RCM and impact sensor(s). To deplete the backup power supply energy, disconnect the battery ground cable and wait at least 1 minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped). Failure to follow these instructions may result in serious personal injury or death in the event of an accidental deployment.

**⚠ WARNING:** Always lift a plastic-cased battery with a battery carrier or with hands on opposite corners. Excessive pressure on the battery end walls may cause acid to flow through the vent caps, resulting in personal injury and/or damage to the vehicle or battery.

**⚠ WARNING:** Battery posts, terminals and related accessories contain lead and lead components. Wash hands after handling. Failure to follow these instructions may result in serious personal injury.

**NOTE:** When the battery (or PCM) is disconnected and connected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The charging system setpoint may also vary. The vehicle may need to be driven to relearn its strategy.

1. **NOTE:** When disconnecting the battery ground cable to interrupt power to the vehicle electrical system, disconnect the battery ground cable only. It is not necessary to disconnect the positive battery cable.

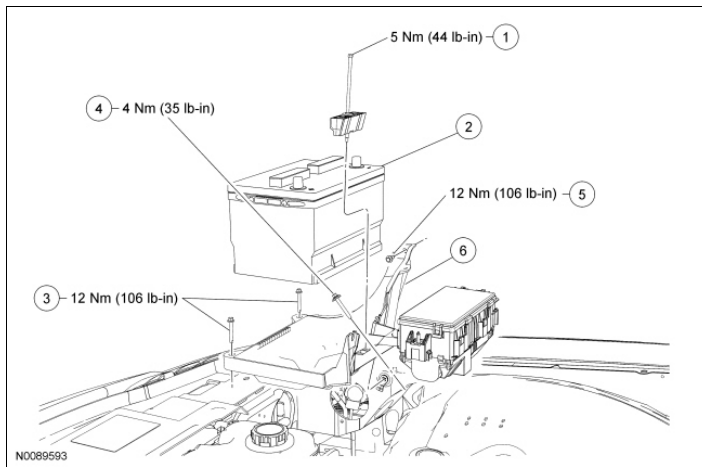
Disconnect the battery ground cable.

- To connect, tighten to 6 Nm (53 lb-in).
2. Disconnect the positive battery cable.
    - To connect, tighten to 6 Nm (53 lb-in).
  3. To connect, reverse the disconnect procedure.
-



SECTION 414-01: Battery, Mounting and  
Cables  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

**Battery and Battery Tray - Exploded View**

Item	Part Number	Description
1	-	Battery hold-down clamp and bolt (part of 10732)
2	10655	Battery
3	N808480	Battery tray bolts (2 required)
4	N808480	Battery tray bolt
5	N807316	Battery tray bolt
6	10732	Battery tray

1. For additional information, refer to the procedures in this section.

## Battery

### Removal and Installation

**⚠ WARNING:** Batteries contain sulfuric acid and produce explosive gases. Work in a well-ventilated area. Do not allow the battery to come in contact with flames, sparks or burning substances. Avoid contact with skin, eyes or clothing. Shield eyes when working near the battery to protect against possible splashing of acid solution. In case of acid contact with skin or eyes, flush immediately with water for a minimum of 15 minutes, then get prompt medical attention. If acid is swallowed, call a physician immediately. Failure to follow these instructions may result in serious personal injury.

**⚠ WARNING:** Always deplete the backup power supply before repairing or installing any new front or side air bag supplemental restraint system (SRS) component and before servicing, removing, installing, adjusting or striking components near the front or side impact sensors or the restraints control module (RCM). Nearby components include doors, instrument panel, console, door latches, strikers, seats and hood latches. Refer to the Description and Operation portion of Section 501-20B for location of the RCM and impact sensor(s). To deplete the backup power supply energy, disconnect the battery ground cable and wait at least 1 minute. Be sure to disconnect auxiliary batteries and power supplies (if equipped). Failure to follow these instructions may result in serious personal injury or death in the event of an accidental deployment.

**⚠ WARNING:** Always lift a plastic-cased battery with a battery carrier or with hands on opposite corners. Excessive pressure on the battery end walls may cause acid to flow through the vent caps, resulting in personal injury and/or damage to the vehicle or battery.

**NOTE:** When the battery (or PCM) is disconnected and connected, some abnormal drive symptoms may occur while the vehicle relearns its adaptive strategy. The charging system setpoint may also vary. The vehicle may need to be driven to relearn its strategy.

1. Disconnect the battery. For additional information, refer to Battery Disconnect in this section.
  2. Remove the bolt and the battery hold-down clamp.
    - To install, tighten to 5 Nm (44 lb-in).
  3. Remove the battery.
  4. To install, reverse the removal procedure.
-



## **Battery Tray**

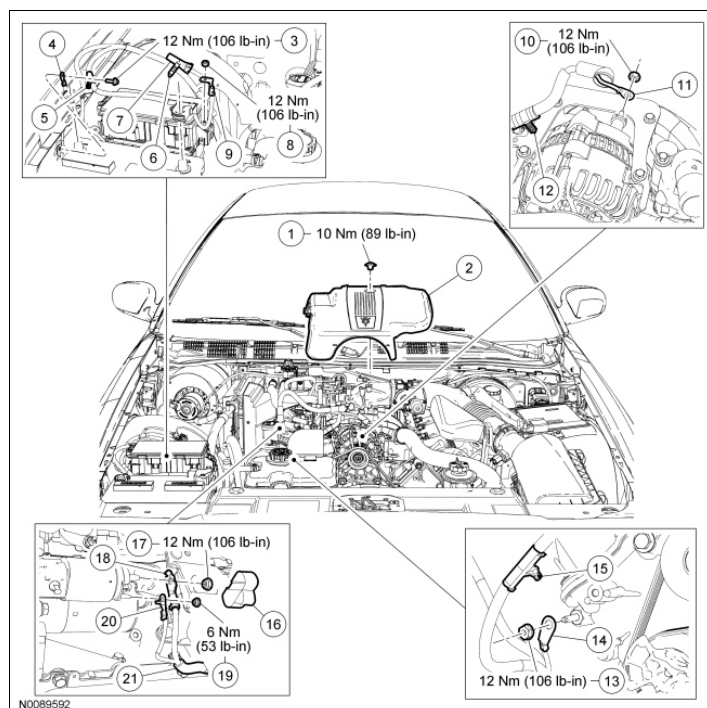
### **Removal and Installation**

1. Remove the battery. For additional information, refer to Battery in this section.
  2. Remove the 4 bolts and the battery tray.
    - To install, tighten the bolts-to-radiator support and inner fender to 12 Nm (106 lb-in).
    - To install, tighten the bolt in the apron shield to 4 Nm (35 lb-in).
  3. To install, reverse the removal procedure.
-

SECTION 414-01: Battery, Mounting and  
Cables  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop  
Manual  
Procedure revision date: 08/19/2009

## Battery Cables



Item	Part Number	Description
1	N808455	Engine cover nut
2	6A946	Engine cover
3	W705661	Battery cable body ground terminal bolt
4	-	Battery cable body ground terminal (part of 14B060)
5	-	Battery cable harness locator (part of 14B060)
6	-	Battery cable harness locator (part of 14B060)
7	-	Battery cable connector to 14290 harness (part of 14B060)
8	W520101	Battery Junction Box (BJB) cable terminal nut
9	-	BJB cable terminal (part of 14B060)
10	W711953	Generator B+ terminal nut
11	-	Generator B+ terminal (part of 14B060)
12	-	Generator B+ harness locator (part of 14B060)
13	W706414	Battery cable engine ground terminal nut
14	-	Battery cable engine ground terminal (part of 14B060)
15	-	Battery cable harness locator (part of 14B060)
16	11N087	Starter terminal cover
17	W706414	Starter solenoid positive terminal nut
18	-	Starter solenoid positive terminal (part of 14B060)
19	W705790	Starter solenoid wire terminal nut



20	-	Starter solenoid wire terminal (part of 14B060)
21	14B060	Battery cable harness

**Removal and Installation**

1. **⚠ WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in Section 100-02B . Failure to follow the instructions may result in serious personal injury.**

Depower the fire suppression system.

2. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02A .
3. Disconnect the battery. For additional information, refer to Battery Disconnect in this section.
4. Remove the nut and position the engine cover aside.
  - To install, tighten to 10 Nm (89 lb-in).
5. Remove the bolt and position the battery cable body ground terminal aside.
  - To install, tighten to 12 Nm (106 lb-in).
6. Remove the 2 harness locators.
7. Remove the nut and position the Battery Junction Box (BJB) terminal aside.
  - To install, tighten to 12 Nm (106 lb-in).
8. Remove the nut and position the generator B+ terminal aside.
  - To install, tighten to 12 Nm (106 lb-in).
9. Remove the harness locator from the generator bracket.
10. Remove the nut and position the battery cable engine ground terminal aside.
  - To install, tighten to 12 Nm (106 lb-in).
11. Remove the battery cable harness locator from the valve cover stud bolt.
12. Remove the starter terminal cover.
13. Remove the nut and position the starter solenoid positive terminal aside.
  - To install, tighten to 12 Nm (106 lb-in).
14. Remove the nut and position the starter solenoid wire terminal aside.
  - To install, tighten to 6 Nm (53 lb-in).
15. Remove the battery cable harness.
16. To install, reverse the removal procedure.
17. **⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to Section 100-02B . Failure to follow these instructions may result in serious personal injury.**

Repower the fire suppression system.



## **Information and Entertainment System**

### **Functional Components**

The functional components of the audio system (and their location) are as follows:

- Audio unit
- Two front door speakers (one in each door)
- Two parcel shelf-mounted speakers
- Subwoofer (if equipped)
- In-glass antenna
- AM/FM antenna cables
- Steering wheel controls (if equipped)

### **Audio Line-Up**

There are 3 audio systems available:

- Base system (AM/FM audio unit)
- Mid-level system (single CD or dual-media audio unit)
- Premium system (6-CD audio unit)

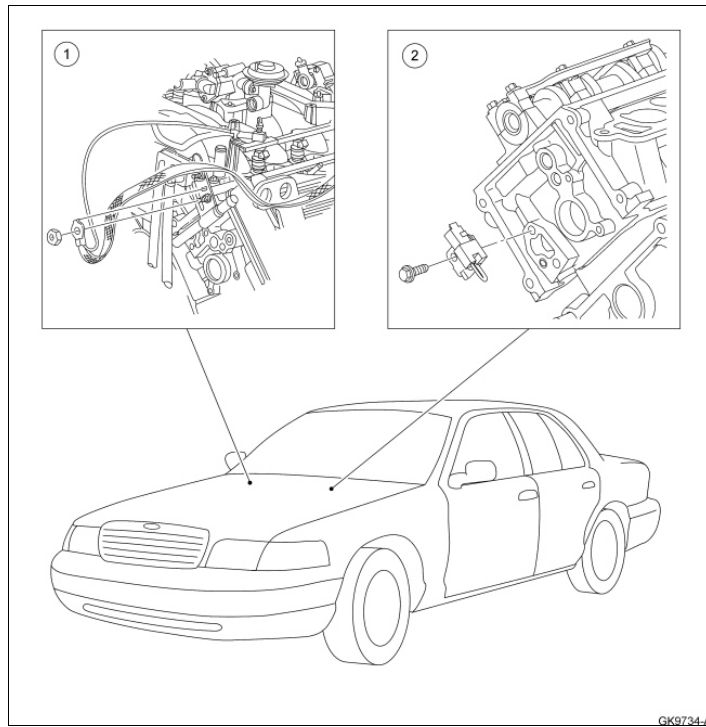
The base and mid-level audio systems consist of:

- Two front door speakers
- Two package tray speakers

The Premium system consists of:

- Two 2-way front door speakers
- Two 2-way package tray speakers
- Subwoofer under the package tray

### **Radio Frequency Interference Suppression Equipment**



Item	Part Number	Description
1	19A095	Radio ignition interference bond
2	18801	Radio ignition interference capacitor

The radio suppression equipment reduces interference transmitted through the radio speakers by the engine ignition and electrical system.

### Antenna

The antenna system consists of the following:

- Antenna cables
- Antenna module



The antenna cable is not removable from the wiring harness. If the antenna cable needs to be replaced, cut the ends and leave the cable in the wiring harness. Route the new cable on top of the body main wiring harness and secure it with wire ties. Do not cut into the wiring harness to remove the existing antenna cable.

The antenna lead-in cable is connected to the audio unit and has an in-line connector (located at the right end of the instrument panel below the glove compartment) to the antenna cable. The antenna cable runs along the rocker panel within the body main wiring harness, and runs up the passenger side C-pillar to the antenna module.



**Information and Entertainment System**

## Special Tool(s)

	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
	Flex Probe Kit 105-R025D or equivalent

**Principles of Operation**

When the audio unit is powered up, a fluctuating AC voltage audio signal is sent from the audio unit to the speakers to produce sound. For vehicles equipped with an optional subwoofer, when the audio unit is powered up, a wake-up signal is sent to the subwoofer amplifier. Audio output signals are then sent continuously to the subwoofer amplifier. These signals are amplified and sent to the subwoofer speaker as a fluctuating AC voltage.

The steering wheel controls consist of a series of resistors. Each steering wheel control switch function corresponds with a specific resistance value within the switch. When a switch is pressed, the audio unit monitors the change in reference voltage to determine the requested function.

The audio unit has a self-diagnostic mode that can be entered by pressing specific preset buttons simultaneously. Refer to the Speaker Walk-Around Test and the Audio Control Module Self-Diagnostic Mode in this section.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 419-03](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Audio unit</li> <li>• Antenna</li> <li>• Radio speakers and mounting/speaker cones</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 12 (20A)</li> <li>• Central Junction Box (CJB) fuse(s): <ul style="list-style-type: none"> <li>◆ 3 (5A)</li> <li>◆ 9 (7.5A)</li> <li>◆ 12 (15A)</li> </ul> </li> <li>• Wiring, terminals or connectors</li> </ul>

- |  |  |
|--|--|
|  | <ul style="list-style-type: none"> <li>• Radio frequency interference suppression equipment</li> </ul> |
|--|--|

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and proceed to diagnose the audio system by entering the speaker walk-around test.

### Speaker Walk-Around Test

**NOTE:** To enter the speaker walk-around test, the audio unit must be turned on and in radio tuner mode (AM/FM).

1. To enter the speaker walk-around test, simultaneously press and hold the audio unit preset buttons 3 and 6 (1 and 4 for ULC radio only) for approximately 3 seconds, then release.
2. The speaker walk-around test stops and applies sound to each speaker for about 1-2 seconds. Each speaker is tested and displayed on the audio unit in the following sequence: RF, LF, LR, RR.

### Audio Unit Self-Diagnostic Mode

**NOTE:** The audio unit self-diagnostic mode can only be entered while in the speaker walk-around test.

1. The audio unit self-diagnostic mode has 5 tests available:
  - Preset button 1 = Audio internal/external SELF-TEST. If SELF FAIL is displayed, press the TUNE > button to scroll view the DTCs stored. Refer to the Audio Unit DTC Chart. If the system is OK, SELF PASS is displayed.
  - Preset button 2 = View/clear continuous DTCs. NO DTCS is displayed if no DTCs are retrieved. If DTCS FOUND is displayed, press the TUNE > button to view the DTCs retrieved. Refer to the Audio Unit DTC Chart. To clear all DTCs, press the EJECT button. DTCS CLEAR is displayed.
  - Preset button 3 = SIGNAL TEST. This test measures the average strength at the current tuner setting.
  - Preset button 4 = Software configuration level. This test queries each radio system controller for its software configuration level. SOFT LEVELS is displayed upon completion of the query. Press the TUNE > button to scroll view the software configuration version level.

### Configurations and Software Levels

Controller	Description	Radio Display Example
Main	Main micro software version	MAIN #####
CDSP	CDSP micro software version	CDSP #####
ADSP	ADSP micro software version	ADSP #####
CD/DJ	CD/DJ software version	DJ #####
CD changer	CDR software version	CD #####
RICP	Rear seat control	RICP #####

RSWC	Redundant steering wheel control software version	RSWC #####
EQ	EQ ID, model, EQ version	EQ #####

- Preset button 5 = DISPLAY TEST. This test lights all the audio unit display segments for 5 seconds and then turns all segments off. When the test is complete, DISPLAY TEST is displayed on the bezel.
2. To enter these tests, press the preset button desired while in the speaker walk-around test. This aborts the speaker walk-around test and starts the selected test.
  3. To exit the audio unit self-diagnostic mode, turn the ignition switch or audio unit off.
  4. If the concern remains and the fault is not detected, GO to Symptom Chart .

## DTC Charts

### Audio Unit DTC Chart

DTC	Description	Action
B1342	ECU is Faulted	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.
B2403	Audio CD/DJ Internal Fault	CLEAR the DTCs. REPEAT the self-test. If DTC B2403 is retrieved again, INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.
B2404	Audio Steering Wheel Switch Circuit Failure	<u>GO to Pinpoint Test E</u> .
B2405	Audio Disc CD Player Thermal Shutdown Fault	ALLOW the CD mechanism to cool down for approximately 30 minutes. INSERT a CD and OPERATE the audio unit in CD player mode. CLEAR the DTCs. REPEAT the self-test. If DTC B2405 is retrieved again, INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.
B2406	Audio Disc CD Player Internal Fault	CLEAR the DTCs. REPEAT the self-test. If DTC B2406 is retrieved again, INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.
U2003	Audio Compact Disk/Disk Jockey Unit is Not Responding	DISREGARD the DTC.
U2005	Audio Rear Integrated Control Panel Unit/RDM is Not Responding	DISREGARD the DTC.
U2008	Audio Phone is Not Responding	DISREGARD the DTC.
U2024	Audio Redundant Steering Wheel Control Not Responding	<u>GO to Pinpoint Test E</u> .

## Symptom Chart



## Symptom Chart

## Pinpoint Tests

**Pinpoint Test A: The Audio Unit Is Inoperative/Does Not Operate Correctly**

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

**Normal Operation**

The audio unit receives power at all times, and has a separate circuit to provide power in RUN and ACC.

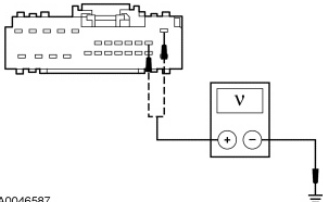
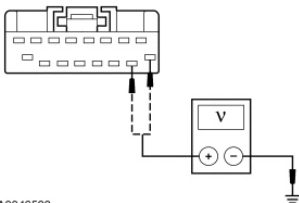
**This pinpoint test is intended to diagnose the following:**

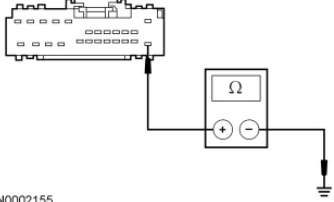
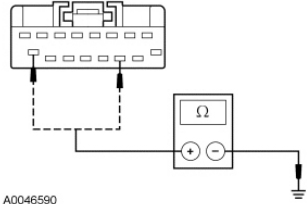
- Fuse
- Wiring, terminals or connectors
- Audio unit

**PINPOINT TEST A: THE AUDIO UNIT IS INOPERATIVE/DOES NOT OPERATE CORRECTLY**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>A1 CHECK THE RADIO SIGNAL RECEPTION FOR STATIC OR WEAK RECEPTION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Tune the radio to a clear FM station.</li> <li>• Cycle the rear window defrost from the ON position to the OFF position while listening to the radio.</li> <li>• <b>Is the audio unit signal reception weak or is static present only when the rear window defrost is ON?</b></li> </ul>	<p><b>Yes</b> INSPECT the defroster grid tabs and connector for a secure connection, REFER to <u>Section 501-11</u> to repair the rear window defrost grid or lead terminal.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE OPERATION OF THE AUDIO UNIT</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Operate the audio unit in radio tuner (AM/FM) mode.</li> <li>• <b>Is the audio unit display illuminated?</b></li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> GO to <u>A5</u> .</p>
<b>A3 CHECK FOR SOUND COMING FROM THE AUDIO UNIT SPEAKERS</b>	
<ul style="list-style-type: none"> <li>• Carry out the speaker walk-around test.</li> <li>• Verify that sound is coming from the speakers.</li> <li>• <b>Is there sound coming from the speakers?</b></li> </ul>	<p><b>Yes</b> GO to <u>A4</u> .</p> <p><b>No</b></p>

	INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.
<b>A4 CHECK THE CONTROLS AND FEATURES</b>	
<ul style="list-style-type: none"> <li>• Refer to the Owner's Literature for audio system controls.</li> <li>• Verify that all the controls and features operate correctly.</li> <li>• <b>Do all the controls and features operate correctly?</b></li> </ul>	<p><b>Yes</b> The system is operating correctly at this time.</p> <p><b>No</b> INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.</p>
<b>A5 CHECK THE VOLTAGE TO THE AUDIO UNIT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Audio Unit C290a (Except Base).</li> <li>• Disconnect: Audio Unit C240 (Base).</li> <li>• Ignition ON.</li> <li>• For all vehicles except base, measure the voltage between the audio unit C290a-1, circuit 1772 (VT), harness side and ground; and between the audio unit C290a-2, circuit 964 (DB/LG), harness side and ground.</li> </ul>  <p>A0046587</p> <ul style="list-style-type: none"> <li>• For vehicles with base audio, measure the voltage between the audio unit C240-9, circuit 1772 (VT), harness side and ground; and between the audio unit C240-10, circuit 964 (DB/LG), harness side and ground.</li> </ul>  <p>A0046588</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>A6</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 9 (7.5A) or fuse 12 (15A) is OK. If OK, REPAIR the circuit in question. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>A6 CHECK THE AUDIO UNIT GROUND CIRCUIT FOR CONTINUITY</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• For all vehicles except base, measure the resistance between the audio unit C290a-13, circuit 694 (BK/LG), harness side and ground.</li> </ul>  <p>N0002155</p> <ul style="list-style-type: none"> <li>• For vehicles with base audio, measure the resistance between the audio unit C240-11, circuit 694 (BK/LG), harness side and ground; and between the audio unit C240-16, circuit 694 (BK/LG), harness side and ground.</li> </ul>  <p>A0046590</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	<p><b>Yes</b>  <b>INSTALL</b> a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.</p> <p><b>No</b>  <b>REPAIR</b> the circuit in question. TEST the system for normal operation.</p>
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## Pinpoint Test B: Poor Reception

### Normal Operation

Audio waves are received by the antenna and transferred to the audio unit through the antenna cables. The radio suppression equipment reduces interference caused by the electrical components of the ignition and charging systems. When the SEEK/SCAN button is pressed, the audio unit searches for a channel with sufficient audio signal strength and automatically stops when it reaches such a channel.

**This pinpoint test is intended to diagnose the following:**

- Noise suppression equipment
- Antenna
- Antenna connections
- Antenna cable
- Charging system
- Ignition system
- Audio unit

**PINPOINT TEST B: POOR RECEPTION**

<b>Test Step</b>	<b>Result / Action to Take</b>
<b>B1 CHECK THE RADIO RECEPTION</b>	
<ul style="list-style-type: none"> <li>• Check the audio unit signal reception with the engine running and with the engine off.</li> <li>• <b>Does the poor reception only occur with the engine running?</b></li> </ul>	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> GO to <u>B8</u> .</p>
<b>B2 CHECK THE SUPPRESSION EQUIPMENT</b>	
<ul style="list-style-type: none"> <li>• Check all necessary suppression equipment, the radio frequency interference suppression bond and the radio receiver hood bonding strap for security, cleanliness, and metal-to-metal contact.</li> <li>• <b>Are the contacts clean, secure, and in metal-to-metal contact?</b></li> </ul>	<p><b>Yes</b> GO to <u>B3</u> .</p> <p><b>No</b> INSTALL new radio frequency interference suppression bonds or related equipment, or CLEAN and SECURE the connections as necessary. TEST the system for normal operation.</p>
<b>B3 CHECK THE CAPACITOR MOUNTING AND CONNECTING CIRCUITS</b>	
<p><b>NOTE:</b> The capacitor mounting points are used to complete the electrical circuit and must be mounted securely to clean surfaces.</p> <ul style="list-style-type: none"> <li>• Check the mounting and connecting circuits of the radio ignition interference capacitor(s) for security, cleanliness, and metal-to-metal contact.</li> <li>• <b>Are the contacts clean, secure, and in metal-to-metal contact?</b></li> </ul>	<p><b>Yes</b> GO to <u>B4</u> .</p> <p><b>No</b> CLEAN or SECURE the connections as necessary. TEST the system for normal operation.</p>
<b>B4 CHECK THE RADIO IGNITION INTERFERENCE CAPACITOR(S) AND GENERATOR</b>	
<ul style="list-style-type: none"> <li>• Check the operation of the radio ignition interference capacitor(s) by installing known good component(s).</li> <li>• Check the generator by disconnecting the wiring harness from the voltage regulator.</li> <li>• Start the engine.</li> <li>• Verify the operation of the audio unit.</li> <li>• <b>Is the reception OK?</b></li> </ul>	<p><b>Yes</b> REPAIR or INSTALL new components as necessary. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>B5</u> .</p>
<b>B5 CHECK THE IGNITION CIRCUITS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the ignition circuits for correct routing, grounding, and security of connections.</li> </ul>	<p><b>Yes</b> GO to <u>B6</u> .</p> <p><b>No</b> REPAIR the circuits as necessary. TEST the system</p>

<ul style="list-style-type: none"> <li>• <b>Are the circuits OK?</b></li> </ul>	for normal operation.
<b>B6 CHECK THE IGNITION SYSTEM</b>	
<ul style="list-style-type: none"> <li>• Test the ignition system.</li> <li>• <b>Is the ignition system OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>B7</u> .</p> <p><b>No</b> REPAIR the ignition system. TEST the system for normal operation.</p>
<b>B7 SUBSTITUTE THE AUDIO UNIT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Substitute a known good audio unit.</li> <li>• Start the engine.</li> <li>• Verify the operation of the audio unit.</li> <li>• <b>Is the reception OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL the original audio unit. USE a jumper cable to ground various parts of the vehicle to the frame (for example, the engine, fenders, quarter panels, stone deflectors, engine air cleaner or body sheet metal). When the noise is eliminated, PROVIDE a permanent ground where necessary. TEST the system for normal operation.</p>
<b>B8 CHECK THE ON-GLASS ANTENNA</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Antenna Lead Terminal.</li> <li>• Measure the resistance between the antenna cable lead terminal and the antenna grid wire.</li> <li>• <b>Is the resistance less than 8 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>B9</u> .</p> <p><b>No</b> REPAIR the grid lines as necessary. REFER to <u>Section 501-11</u> . TEST the system for normal operation.</p>
<b>B9 SUBSTITUTE THE ANTENNA EXTENSION CABLE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Substitute a known good antenna cable.</li> <li>• Start the engine.</li> <li>• Verify the operation of the audio unit.</li> <li>• <b>Is the reception OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new antenna cable. REFER to <u>Antenna Lead-In Cable</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL the original antenna cable. GO to <u>B10</u> .</p>
<b>B10 SUBSTITUTE THE ANTENNA MODULE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Substitute a known good antenna module.</li> <li>• Start the engine.</li> <li>• Check the operation of the audio unit.</li> <li>• <b>Is the reception OK?</b></li> </ul>	<p><b>Yes</b> INSTALL a new antenna module. REFER to <u>Antenna Module</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL the original antenna module. INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test C: Poor Quality/Distorted/No Sound From One Or More Speakers**

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

**Normal Operation**

When the key is placed in START, voltage is sent to the audio unit through the START sense circuit. When the audio unit receives this signal, it mutes the speaker signals. After the key is removed from START, the audio unit directs audio signals to the speakers through separate positive and negative circuits. The audio unit provides internal circuit protection for shorts to ground, shorts to voltage, or shorts between any output circuits.

In addition, a short on an individual speaker circuit can cause all speakers to lose sound due to the built-in overload protection feature of the audio unit.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Speaker
- Audio unit

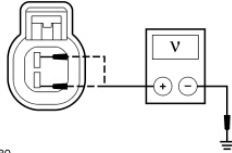
**PINPOINT TEST C: POOR QUALITY/DISTORTED/NO SOUND FROM ONE OR MORE SPEAKERS**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Use the speaker walk-around test to determine which speaker(s) has a concern.

Test Step		Result / Action to Take																					
<b>C1 CHECK THE SPEAKER CIRCUITS FOR A SHORT TO VOLTAGE</b>																							
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Audio Unit C290a (Except Base).</li> <li>• Disconnect: Audio Unit C240 (Base).</li> <li>• Disconnect: Suspect Speaker(s).</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the suspect speaker, harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Suspect Speaker</th><th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>LH front</td><td>C523-1</td><td>804 (OG/LG)</td></tr> <tr> <td>LH front</td><td>C523-2</td><td>813 (LB/WH)</td></tr> <tr> <td>RH front</td><td>C612-1</td><td>805 (WH/LG)</td></tr> <tr> <td>RH front</td><td>C612-2</td><td>811 (DG/OG)</td></tr> <tr> <td>LH rear</td><td>C484-1</td><td>800 (GY/LB)</td></tr> <tr> <td>LH rear</td><td>C484-2</td><td>801 (TN/YE)</td></tr> </tbody> </table>		Suspect Speaker	Connector-Pin	Circuit	LH front	C523-1	804 (OG/LG)	LH front	C523-2	813 (LB/WH)	RH front	C612-1	805 (WH/LG)	RH front	C612-2	811 (DG/OG)	LH rear	C484-1	800 (GY/LB)	LH rear	C484-2	801 (TN/YE)	<p><b>Yes</b> REPAIR the circuit in question. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C2</u> .</p>
Suspect Speaker	Connector-Pin	Circuit																					
LH front	C523-1	804 (OG/LG)																					
LH front	C523-2	813 (LB/WH)																					
RH front	C612-1	805 (WH/LG)																					
RH front	C612-2	811 (DG/OG)																					
LH rear	C484-1	800 (GY/LB)																					
LH rear	C484-2	801 (TN/YE)																					

RH rear	C485-1	802 (OG/RD)
RH rear	C485-2	803 (BN/PK)



N0085780

- Is any voltage present?

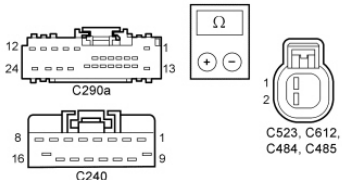
### C2 CHECK THE SPEAKER CIRCUITS FOR AN OPEN OR SHORT TO GROUND

- Ignition OFF.
- Measure the resistance between the audio unit, harness side and the suspect speaker, harness side; and between the audio unit, harness side and ground as follows:

**Yes**  
GO to C3 .

**No**  
REPAIR the circuit in question. TEST the system for normal operation.

Suspect Speaker	Audio Unit Connector-Pin (Except Base)	Audio Unit Connector-Pin (Base)	Speaker Connector-Pin	Circuit
LH front	C290a-8	C240-14	C523-1	804 (OG/LG)
LH front	C290a-21	C240-15	C523-2	813 (LB/WH)
RH front	C290a-11	C240-7	C612-1	805 (WH/LG)
RH front	C290a-12	C240-8	C612-2	811 (DG/OG)
LH rear	C290a-9	C240-12	C484-1	800 (GY/LB)
LH rear	C290a-22	C240-13	C484-2	801 (TN/YE)
RH rear	C290a-10	C240-5	C485-1	802 (OG/RD)
RH rear	C290a-23	C240-6	C485-2	803 (BN/PK)

 <p>• Is the resistance less than 5 ohms between the audio unit and the suspect speaker, and greater than 10,000 ohms between the audio unit and ground?</p>	
<b>C3 CHECK THE SPEAKER</b>	
<ul style="list-style-type: none"> <li>• Connect: Audio Unit C290a (Except Base).</li> <li>• Connect: Audio Unit C240 (Base).</li> <li>• Substitute a known good speaker for the suspect speaker.</li> <li>• Operate the audio unit in radio tuner mode.</li> <li>• Is the sound quality OK?</li> </ul>	<p><b>Yes</b> INSTALL a new speaker. REFER to <u>Door Speaker</u> or <u>Parcel Shelf Speaker</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.</p>

**Pinpoint Test D: The Subwoofer Is Inoperative/Does Not Operate Correctly**

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

**Normal Operation**

Audio signals are sent from the audio unit to the subwoofer amplifier, then to the subwoofer. An enable/clip circuit carries out 2 functions: to turn the subwoofer amplifier on, and to monitor an overload condition to the subwoofer amplifier. In the event of an overload, the audio unit clips the audio output signal to the subwoofer amplifier (heard as distortion).

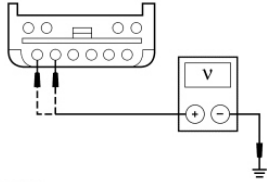
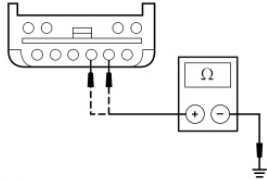
**This pinpoint test is intended to diagnose the following:**

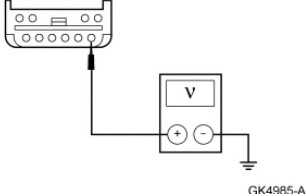
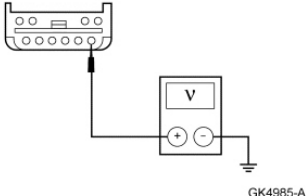
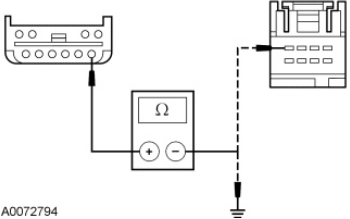
- Fuse
- Wiring, terminals or connectors
- Subwoofer amplifier
- Subwoofer speaker
- Audio unit

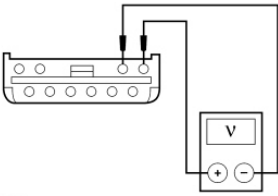
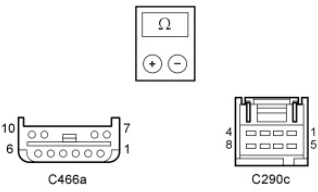
**PINPOINT TEST D: THE SUBWOOFER IS INOPERATIVE/DOES NOT OPERATE CORRECTLY**

Test Step	Result / Action to Take
<b>D1 CHECK THE SUBWOOFER AMPLIFIER VOLTAGE SUPPLY</b>	



<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Subwoofer Amplifier C466a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the subwoofer amplifier C466a-5, circuit 720 (YE), harness side and ground; and between the subwoofer amplifier C466a-6, circuit 720 (YE), harness side and ground.</li> </ul>  <p>N0066392</p> <ul style="list-style-type: none"> <li>• Are the voltages greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>D2 CHECK THE SUBWOOFER GROUND CIRCUITS FOR CONTINUITY</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the subwoofer amplifier C466a-2, circuit 694 (RD), harness side and ground; and between the subwoofer amplifier C466a-3, circuit 694 (RD), harness side and ground.</li> </ul>  <p>N0062249</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<p><b>D3 CHECK FOR AN AUDIO SIGNAL FROM THE SUBWOOFER AMPLIFIER</b></p>	
<ul style="list-style-type: none"> <li>• Connect: Subwoofer Amplifier C466a.</li> <li>• Operate the audio system in radio tuner (AM/FM) mode.</li> <li>• Measure the AC voltage by backprobing between the subwoofer amplifier C466b-3, circuit (BK) and the subwoofer amplifier C466b-4, circuit (BK/WH).</li> <li>• Is a fluctuating AC voltage present?</li> </ul>	<p><b>Yes</b> INSTALL a new subwoofer speaker. REFER to <u>Speaker - Subwoofer</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>D4</u> .</p>
<p><b>D4 CHECK THE SUBWOOFER AMPLIFIER ENABLE CIRCUIT VOLTAGE</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Subwoofer Amplifier C466a.</li> <li>• Operate the audio system in radio tuner (AM/FM) mode.</li> <li>• Measure the voltage between the subwoofer amplifier C466a-1, circuit 173 (WH), harness side and ground.</li> </ul>  <p>• Is the voltage between 3.8 and 6.7 volts?</p>	<p><b>Yes</b> GO to <u>D7</u> .</p> <p><b>No</b> GO to <u>D5</u> .</p>
<b>D5 CHECK THE SUBWOOFER AMPLIFIER ENABLE CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Audio Unit C290c.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the subwoofer amplifier C466a-1, circuit 173 (WH), harness side and ground.</li> </ul>  <p>• Is any voltage present?</p>	<p><b>Yes</b> REPAIR the circuit. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>D6</u> .</p>
<b>D6 CHECK THE SUBWOOFER AMPLIFIER ENABLE CIRCUIT FOR AN OPEN OR SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the voltage between the subwoofer amplifier C466a-1, circuit 173 (WH), harness side and the audio unit C290c-4, circuit 173 (DG/VT), harness side; and between the subwoofer amplifier C466a-1, circuit 173 (WH), harness side and ground.</li> </ul>  <p>• Is the resistance less than 5 ohms between the subwoofer amplifier and the audio unit, and greater than 10,000 ohms between the subwoofer amplifier and ground?</p>	<p><b>Yes</b> GO to <u>D9</u> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>

<b>D7 CHECK THE AUDIO SIGNAL TO THE SUBWOOFER AMPLIFIER</b>	
<ul style="list-style-type: none"> <li>• Operate the audio system in radio tuner (AM/FM) mode.</li> <li>• Measure the voltage between the subwoofer amplifier C466a-7, circuit 168 (BK), harness side and the subwoofer amplifier C466a-8, circuit 167 (GN), harness side.</li> </ul>  <p>A0057176</p> <ul style="list-style-type: none"> <li>• <b>Is a fluctuating AC voltage present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new subwoofer amplifier. REFER to <u>Subwoofer Amplifier</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>D8</u> .</p>
<b>D8 CHECK THE AUDIO CIRCUITS TO THE SUBWOOFER AMPLIFIER FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Audio Unit C290c.</li> <li>• Measure the resistance between the subwoofer amplifier C466a-7, circuit 168 (BK), harness side and the audio unit C290c-1, circuit 167 (BN/OG), harness side; and between the subwoofer amplifier C466a-8, circuit 167 (GN), harness side and the audio unit C290c-2, circuit 168 (RD/BK) harness side.</li> </ul>  <p>N0102340</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms between the subwoofer amplifier and the audio unit and greater than 10,000 ohms between the subwoofer amplifier and ground?</b></li> </ul>	<p><b>Yes</b> GO to <u>D9</u> .</p> <p><b>No</b> REPAIR the circuit in question. TEST the system for normal operation.</p>
<b>D9 CHECK FOR CORRECT AUDIO UNIT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the audio unit connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the audio unit connectors and make sure they seat correctly.</li> <li>• Operate the system and determine if the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> REMOVE the audio unit. REFER to <u>Audio Unit</u> in this section. SEND it to an authorized repair facility. TEST the system for normal operation after the repair.</p> <p><b>No</b> The system is operating correctly at this time. The</p>

concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.
--

**Pinpoint Test E: The Steering Wheel Controls Are Inoperative/Do Not Operate Correctly**

Refer to Wiring Diagrams Cell 130 , Audio System for schematic and connector information.

**Normal Operation**

The audio unit sends a reference voltage to the steering wheel controls. Each steering wheel control switch function corresponds with a specific resistance value within the switch. When a switch is pressed, the audio unit monitors the change in reference voltage to determine the requested function.

- DTC B2404 (Audio Steering Wheel Switch Circuit Failure) - may set when a fault is detected in the steering wheel controls circuit. If the vehicle is not equipped with steering wheel controls, disregard this DTC.
- DTC U2024 (Audio Redundant Steering Wheel Control Not Responding) - sets when any fault is detected in the steering wheel controls circuit.

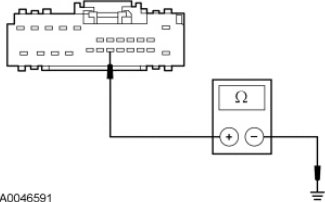
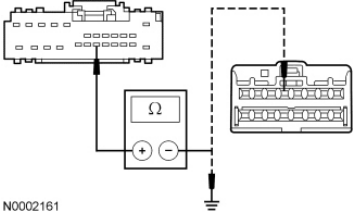
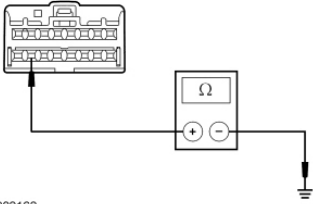
**This pinpoint test is intended to diagnose the following:**

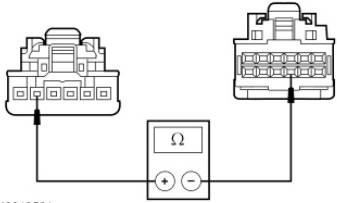
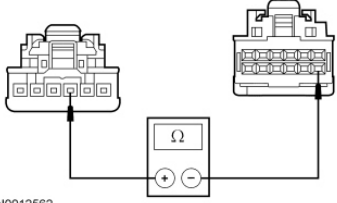
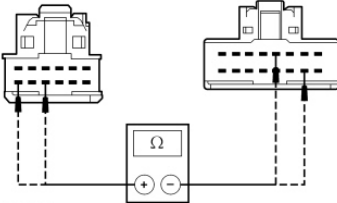
- Wiring, terminals or connectors
- Clockspring
- Steering wheel controls
- Audio unit

**PINPOINT TEST E: THE STEERING WHEEL CONTROLS ARE INOPERATIVE/DO NOT OPERATE CORRECTLY**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take				
<b>E1 CHECK THE STEERING WHEEL CONTROLS RESISTANCE VALUES</b>					
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Audio Unit C290a.</li> <li>• Measure the resistance between the audio unit C290a-18, circuit 595 (LB/RD), harness side and ground while pressing the steering wheel controls as follows:</li> </ul> <table border="1"> <tr> <th>Switch</th><th>Resistance range</th></tr> <tr> <td>VOL down</td><td>30-132 ohms</td></tr> </table>	Switch	Resistance range	VOL down	30-132 ohms	<p><b>Yes</b> INSTALL a new audio unit. REFER to <u>Audio Unit</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>E2</u> .</p>
Switch	Resistance range				
VOL down	30-132 ohms				

<table border="1"> <tr> <td>VOL up</td><td>132-312 ohms</td></tr> <tr> <td>NEXT</td><td>312-642 ohms</td></tr> <tr> <td>No switches pressed</td><td>2,894-10,800 ohms</td></tr> </table>  <p>A0046591</p> <ul style="list-style-type: none"> <li>• Are the resistances within specification?</li> </ul>	VOL up	132-312 ohms	NEXT	312-642 ohms	No switches pressed	2,894-10,800 ohms	
VOL up	132-312 ohms						
NEXT	312-642 ohms						
No switches pressed	2,894-10,800 ohms						
<b>E2 CHECK CIRCUIT 595 (LB/RD) FOR AN OPEN OR SHORT TO GROUND</b>							
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• Measure the resistance between the audio unit C290a-18, circuit 595 (LB/RD), harness side and the clockspring C218a-5, circuit 595 (LB/RD), harness side; and between the audio unit C290a-18, circuit 595 (LB/RD), harness side and ground.</li> </ul>  <p>N0002161</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the audio unit and clockspring, and greater than 10,000 ohms between the audio unit and ground?</li> </ul>	<p><b>Yes</b> GO to <u>E3</u> .</p> <p><b>No</b> REPAIR the circuit in question. CLEAR the DTCs. TEST the system for normal operation.</p>						
<b>E3 CHECK CIRCUIT 57 (BK) FOR AN OPEN</b>							
<ul style="list-style-type: none"> <li>• Measure the resistance between the clockspring C218a-15, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0002162</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E4</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.</p>						
<b>E4 CHECK CIRCUIT 595 (LB/RD) FOR AN OPEN</b>							

<ul style="list-style-type: none"> <li>• Remove the driver air bag. Refer to <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Steering Wheel Controls C2208.</li> <li>• Disconnect: Clockspring C218b.</li> <li>• Measure the resistance between the steering wheel controls C2208-5, circuit 595 (LB/RD), harness side and the clockspring C218b-9, circuit 595 (LB/RD), harness side.</li> </ul>  <p>N0012561</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">E5</a>.</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.</p>
<b>E5 CHECK CIRCUIT 57 (BK) IN THE STEERING WHEEL HARNESS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the steering wheel controls C2208-3, circuit 57 (BK), harness side and the clockspring C218b-7, circuit 57 (BK), harness side.</li> </ul>  <p>N0012562</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">E6</a>.</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.</p>
<b>E6 CHECK THE CLOCKSPRING FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the clockspring C218b pin 9, component side and the clockspring C218a pin 5, component side; and between the clockspring C218b pin 7, component side and the clockspring C218a pin 15, component side.</li> </ul>  <p>N0012559</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL new steering wheel controls. REFER to <a href="#">Steering Wheel Controls</a> in this section. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a>. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new clockspring. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a>. CLEAR the DTCs. TEST the system for normal operation.</p>

**Pinpoint Test F: Poor Sound Quality Or Distorted Sound From One Or More Speakers (Not All Speakers)****Normal Operation**

The Audio Front Control Module (ACM) sends audio signals to the speakers in the form of AC voltage, resulting in clear audio output.

**Possible Sources**

- Wiring, terminals, or connectors
- Speaker(s)
- Loose trim panel fasteners
- Loose trim panels
- Loose speaker grille
- Loose harnesses
- Loose items in storage areas
- Loose harness fasteners
- Loose door and handle lock components
- Loose component fasteners
- Watershield bonding and placement

**PINPOINT TEST F: POOR SOUND QUALITY OR DISTORTED SOUND FROM ONE OR MORE SPEAKERS (NOT ALL SPEAKERS)**

Test Step	Result / Action to Take
<b>F1 ISOLATE THE ZONE</b>	
<ul style="list-style-type: none"> <li>• Operate the audio system using digital media (CD, MP3, etc.).</li> <li>• Using the audio system fade and balance feature, adjust the audio sound to each of the four zones (LF, RF, LR and RR) of the vehicle to isolate the poor sound quality.</li> <li>• Locate and apply pressure to the trim panel(s) around the poor sound quality area in question.</li> <li>• <b>Does applying pressure to a trim panel reduce or eliminate the audible noise?</b></li> </ul>	<p><b>Yes</b> REPAIR or REPLACE the trim panel as needed.</p> <p><b>No</b> GO to <u>F2</u> .</p>
<b>F2 REMOVE AND INSPECT BEHIND/UNDERNEATH THE SUSPECT TRIM PANEL(S)</b>	
<ul style="list-style-type: none"> <li>• Remove the trim panel to access the suspect speaker.</li> <li>• Operate the audio system using digital media (CD, MP3, etc.).</li> <li>• Validate where the poor sound quality area is located.</li> <li>• Check: <ul style="list-style-type: none"> <li>◆ Trim panel for loose components (e.g. speaker grille) around the speaker area.</li> <li>◆ Trim panel joining components for missing or broken pieces.</li> <li>◆ Lock and handle mechanical parts for correct attachment.</li> </ul> </li> </ul>	<p><b>Yes</b> REPAIR or REPLACE any loose or broken component or fastener as needed.</p> <p><b>No</b> GO to <u>F3</u> .</p>

<ul style="list-style-type: none"> <li>◆ Wire harnesses for correct routing.</li> <li>◆ Wire harness fasteners for correct attachment.</li> <li>◆ Watershield for correct placement (speaker air path not blocked).</li> <li>◆ Watershield for correct bonding to sheet metal.</li> <li>◆ Storage areas for loose items.</li> <li>◆ All child safety belt anchors (if equipped).</li> <li>◆ All safety belt retractors.</li> <li>◆ All speaker bracket fasteners and other fasteners are secured and tightened to specified torque.</li> </ul> <p>• <b>Was the source of the noise located?</b></p>	
<b>F3 CHECK THE SUSPECT SPEAKER FOR WATER INTRUSION</b>	
<ul style="list-style-type: none"> <li>• Inspect for watermarks.</li> <li>• Check the: <ul style="list-style-type: none"> <li>◆ Cone.</li> <li>◆ Magnet.</li> <li>◆ Basket.</li> </ul> </li> <li>• <b>Are any watermarks present on the speaker?</b></li> </ul>	<p><b>Yes</b>  <b>VERIFY</b> the water shield is in the correct location, <b>REPAIR</b> or <b>REPLACE</b> any trim, door, or speaker seal as required.</p> <p><b>DRY</b> the speaker in question and <b>TEST</b> the system for normal operation.</p> <p><b>No</b>  <b>GO</b> to <b>F4</b> .</p>
<b>F4 ISOLATE SPEAKER TO VERIFY NOISE</b>	
<ul style="list-style-type: none"> <li>• Remove the suspect speaker from its location and leave the speaker connected to the harness.</li> <li>• Hold the speaker away from any trim panel(s) and ensure the speaker is isolated from contact.</li> <li>• Operate the audio system using digital media (CD, MP3, etc.).</li> <li>• <b>Is the noise still present in the suspect speaker?</b></li> </ul>	<p><b>Yes</b>  <b>INSTALL</b> a new speaker for the one in question.</p> <p><b>No</b>  <b>LOCATE</b> the source of the noise and <b>REPAIR</b> as needed.</p>

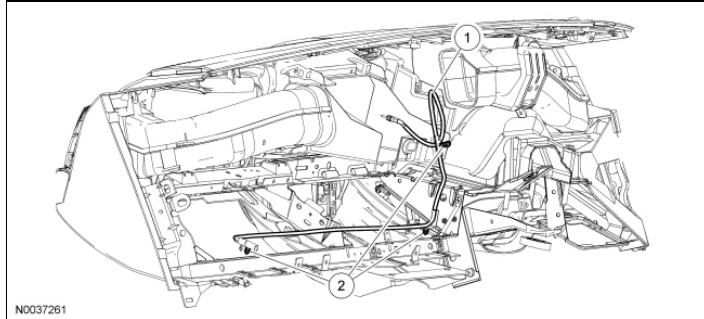




### Audio Unit Part Number Retrieval

**NOTE:** The audio unit must be in radio tuner (AM/FM) mode to retrieve the part number.

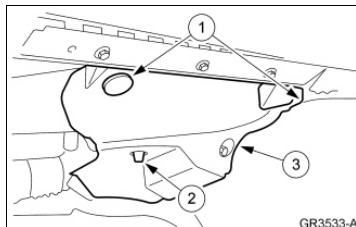
1. Turn the audio unit on.
  2. Press and hold preset buttons 3 and 6 for 3 seconds. The speaker walk-around test will begin.
  3. Before the speaker walk-around test is complete, press preset button 6.
  4. Press the TUNE UP button. This will either directly indicate the part number or it will cause the audio unit to scroll through config 1, config 2, EEPROM, and the part number information.
    - If the audio unit scrolls through the information, Step 4 may need to be repeated until the audio unit part number can be recorded.
  5. Record the audio unit part number.
  6. Turn the audio unit off.
-

**Antenna Lead-In Cable**

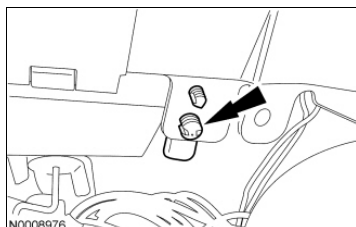
Item	Part Number	Description
1	18812	Antenna lead-in cable
2	-	Antenna lead-in cable retainers (part of 18812)

**Removal and Installation**

1. Remove the audio unit. For additional information, refer to [Audio Unit](#) in this section.
2. Remove the RH lower instrument panel insulator.
  1. Remove the pin-type retainers.
  2. Release the locking tab.
  3. Remove the insulator.
    - Disconnect the courtesy lamp.

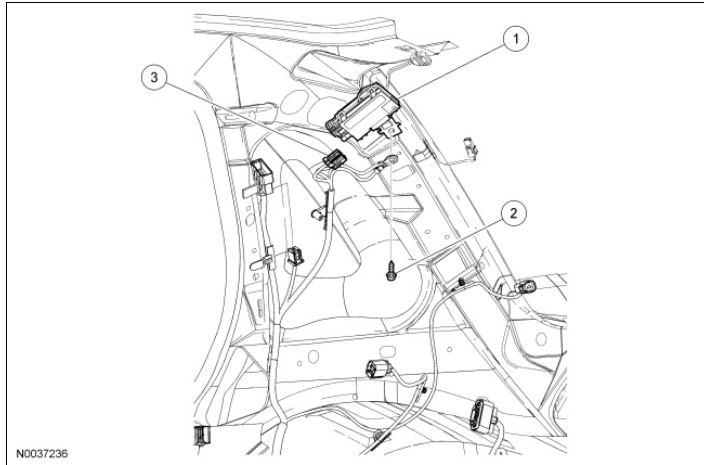


3. Disconnect the antenna lead-in cable.
4. Disengage the antenna lead-in cable pin-type locator retainer.



5. Remove the 3 retainers and the antenna lead-in cable.
6. To install, reverse the removal procedure.



**Antenna Module**

Item	Part Number	Description
1	18812	Antenna module
2	W505263-S	Antenna module bolt
3	-	Antenna module electrical connectors (part of 14A005)


**Removal and Installation**

1. Remove the RH rear quarter trim panel. For additional information, refer to [Section 501-05](#).
2. Remove the bolt and the antenna module.
  - Disconnect the electrical connectors.
3. To install, reverse the removal procedure.



## Audio Unit

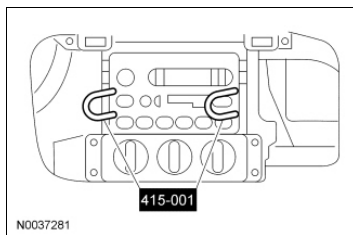
### Special Tool(s)

 <small>ST1445-A</small>	Remover, Audio Unit 415-001 (T87P-19061-A)
--	---

### Removal and Installation

**NOTE:** It is not necessary to remove the audio unit to retrieve the part number. For additional information, refer to [Audio Unit Part Number Retrieval](#) in this section.

1. Using the special tool, remove the audio unit.
  - Disconnect the connectors and the antenna lead-in cable.

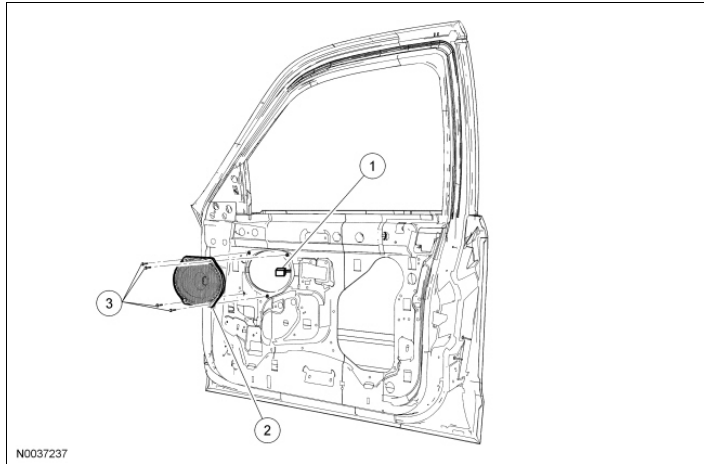


2. To install, reverse the removal procedure.
-

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## Door Speaker

**NOTE:** RH front door shown, LH front door similar.



Item	Part Number	Description
1	-	Door speaker electrical connector (part of 14A005)
2	18808	Door speaker
3	-	Door speaker screws (4 required)

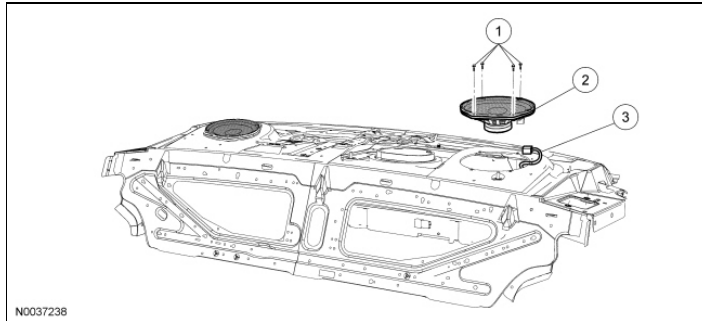
### Removal and Installation

1. Remove the front door trim panel. For additional information, refer to [Section 501-05](#).
  2. Remove the 4 screws and the door speaker.
    - Disconnect the electrical connector.
  3. To install, reverse the removal procedure.
-





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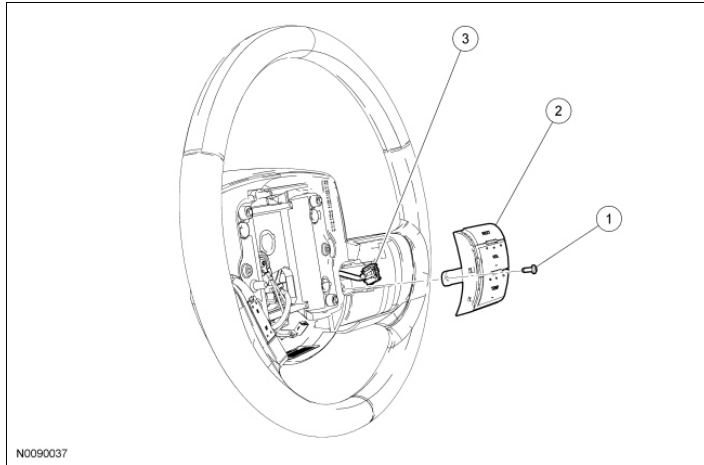
**Parcel Shelf Speaker**

Item	Part Number	Description
1	-	Parcel shelf speaker screws (4 required)
2	18808	Parcel shelf speaker
3	-	Parcel shelf speaker electrical connector (part of 14A005)

**Removal and Installation**

1. Remove the parcel shelf trim panel. For additional information, refer to [Section 501-05](#) .
  2. Remove the 4 screws and the parcel shelf speaker.
    - Disconnect the electrical connector.
  3. To install, reverse the removal procedure.
-

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**Steering Wheel Controls**

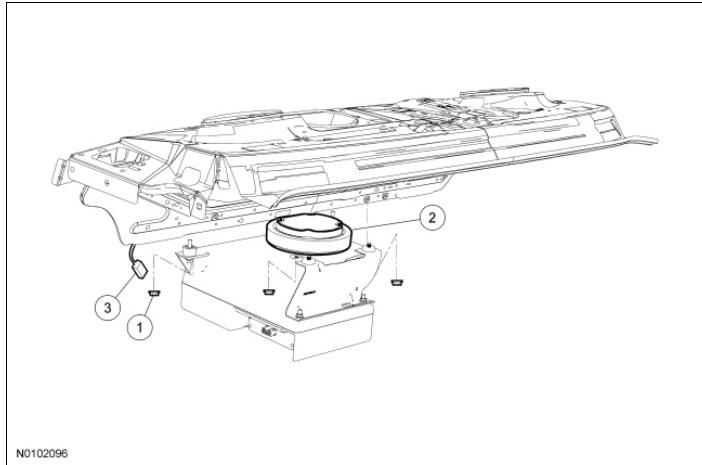
Item	Part Number	Description
1	-	Steering wheel controls screw
2	9C888	Steering wheel controls
3	-	Steering wheel controls electrical connector (part of 3600)

**Removal and Installation**

1. Remove the driver air bag module. For additional information, refer to [Section 501-20B](#) .
  2. Remove the screw and the steering wheel controls.
    - Disconnect the electrical connector.
  3. To install, reverse the removal procedure.
-



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**Speaker - Subwoofer**

Item	Part Number	Description
1	N621940-S	Subwoofer nuts (4 required)
2	18C804	Subwoofer
3	-	Subwoofer electrical connector (part of 14A005)

**Removal and Installation**

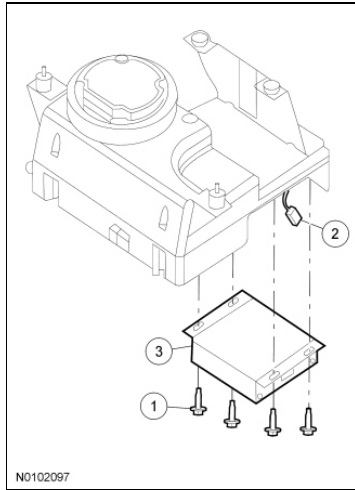
1. Remove the spare tire, if equipped.
2. **NOTE:** Do not let the subwoofer assembly fall into the luggage compartment. Support the subwoofer assembly before removing the fasteners.

Remove the 4 nuts and the subwoofer.

- Disconnect the electrical connector.

3. To install, reverse the removal procedure.
-



**Subwoofer Amplifier**

Item	Part Number	Description
1	-	Subwoofer amplifier screws (4 required) (part of 18C804)
2	-	Subwoofer electrical connectors (part of 18C804)
3	18B849	Subwoofer amplifier

**Removal and Installation**

**NOTE:** The subwoofer amplifier is serviced by itself or as an assembly with the subwoofer speaker and jumper harness if there is a concern with the subwoofer speaker.

1. Remove the subwoofer speaker. For additional information, refer to Speaker - Subwoofer in this section.
2. Remove the 4 screws and the subwoofer amplifier.
  - Disconnect the electrical connectors.
3. To install, reverse the removal procedure.





← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

**GROUP 00: Service Information**

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SECTION 100-01: Identification Codes

SECTION 100-02A: Jacking and Lifting

SECTION 100-02B: Fire Suppression System

SECTION 100-03: Maintenance Schedule

SECTION 100-04: Noise, Vibration and Harshness

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## GROUP 01: Body

---

SECTION 501-00: Body System - General Information

SECTION 501-02: Front End Body Panels

SECTION 501-03: Body Closures

SECTION 501-05: Interior Trim and Ornamentation

SECTION 501-08: Exterior Trim and Ornamentation

SECTION 501-09: Rear View Mirrors

SECTION 501-10: Seating

SECTION 501-11: Glass, Frames and Mechanisms

SECTION 501-12: Instrument Panel and Console

SECTION 501-14: Handles, Locks, Latches and Entry Systems

SECTION 501-16: Wipers and Washers

SECTION 501-19: Bumpers

SECTION 501-20A: Safety Belt System

SECTION 501-20B: Supplemental Restraint System

SECTION 501-35: Body Repairs

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## **GROUP 02: Frame and Mounting**

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### SECTION 502-02: Full Frame and Body Mounting

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## GROUP 03: Engine

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SECTION 303-00: Engine System - General Information

SECTION 303-01: Engine - 4.6L (2V)

SECTION 303-03: Engine Cooling

SECTION 303-04: Fuel Charging and Controls - 4.6L (2V)

SECTION 303-05: Accessory Drive

SECTION 303-06: Starting System

SECTION 303-07: Engine Ignition - 4.6L (2V)

SECTION 303-08: Engine Emission Control

SECTION 303-12: Intake Air Distribution and Filtering

SECTION 303-13: Evaporative Emissions

SECTION 303-14: Electronic Engine Controls

---

## **GROUP 04: Suspension**

---

SECTION 204-00: Suspension System - General Information

SECTION 204-01: Front Suspension

SECTION 204-02: Rear Suspension

SECTION 204-04: Wheels and Tires

SECTION 204-05: Vehicle Dynamic Suspension

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## GROUP 05: Driveline

---

SECTION 205-00: Driveline System - General Information

SECTION 205-01: Driveshaft

SECTION 205-02: Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear

---

## **GROUP 06: Brake System**

---

SECTION 206-00: Brake System - General Information

SECTION 206-03: Front Disc Brake

SECTION 206-04: Rear Disc Brake

SECTION 206-05: Parking Brake and Actuation

SECTION 206-06: Hydraulic Brake Actuation

SECTION 206-07: Power Brake Actuation

SECTION 206-09: Vehicle Dynamic Systems

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

**GROUP 07: Automatic Transmission**

---

SECTION 307-01: Automatic Transaxle/Transmission - 4R70E/4R75E

SECTION 307-02: Transaxle/Transmission Cooling

SECTION 307-05: Automatic Transaxle/Transmission External Controls



← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## GROUP 09: Exhaust System

---

### SECTION 309-00: Exhaust System

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## **GROUP 10: Fuel System**

---

SECTION 310-00: Fuel System - General Information

SECTION 310-01: Fuel Tank and Lines

SECTION 310-02: Acceleration Control

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## GROUP 11: Steering System

---

[SECTION 211-00: Steering System](#)

[SECTION 211-02: Power Steering](#)

[SECTION 211-04: Steering Column](#)

[SECTION 211-05: Steering Column Switches](#)

---

## **GROUP 12: Climate Control System**

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### SECTION 412-00: Climate Control System - General Information and Diagnostics

#### SECTION 412-01: Climate Control

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## **GROUP 13: Instrumentation and Warning Systems**

---

SECTION 413-00: Instrument Cluster and Panel Illumination

SECTION 413-01: Instrumentation, Message Center, and Warning Chimes

SECTION 413-06: Horn

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## **GROUP 14: Battery and Charging System**

---

SECTION 414-00: Charging System

SECTION 414-01: Battery, Mounting and Cables

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## GROUP 15: Audio Systems

---

### SECTION 415-00: Information and Entertainment Systems

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## GROUP 17: Lighting

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SECTION 417-01: Exterior Lighting

SECTION 417-02: Interior Lighting



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## **GROUP 18: Electrical Distribution**

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### SECTION 418-00: Module Communications Network

### SECTION 418-01: Module Configuration

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

---

## **GROUP 19: Electronic Feature Group**

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SECTION 419-01: Anti-Theft - Passive Anti-Theft System (PATS)

SECTION 419-03: Cruise Control

SECTION 419-10: Multifunction Electronic Modules

**Torque Specifications**

<b>Description</b>	<b>Nm</b>	<b>lb-in</b>
Headlamp assembly bolts	5	44
Rear lamp assembly nuts	5	44
Side turn signal lamp nuts	5	44

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## Exterior Lighting

The exterior lighting system consists of the following components:

- Headlamp assemblies
- Lighting Control Module (LCM) (located under the instrument panel rearward of the accelerator pedal)
- Stoplamp switch
- Headlamp switch
- Multifunction switch
- Light sensor
- High mounted stoplamp
- Rear lamp assemblies
- License plate lamps
- Police fuse/relay center(s) and wiring (if equipped)

### Lamp Assembly Condensation

Exterior lamps are vented to accommodate normal changes in pressure. Condensation can be a natural by-product of this design. When moist air enters the lamp assembly through the vents, there is a possibility that condensation can occur if the temperature is cold. When normal condensation occurs, a thin film of mist can form on the interior of the lens. The thin mist eventually clears and exits through the vents during normal operation. Normal condensation clears from any lamp in 48 hours under dry conditions.

Do **NOT** replace a lamp assembly with acceptable levels of condensation such as:

- presence of thin mist (no streaks, drip marks or droplets are present)
- fine mist covers less than 50% of the lens

Examples of unacceptable moisture (usually caused by a lamp housing leak):

- water puddling inside the lamp
- large water droplets, drip marks or streaks present on the interior of the lens

### Headlamps

The headlamp system is a dual-beam pattern system. It consists of a low and high beam, with a replaceable bulb. The Lighting Control Module (LCM) supplies voltage to the headlamps when demanded on. The LCM is located behind the LH instrument panel lower insulator rearward of the accelerator pedal.

The LCM monitors the headlamp switch. If a fault is detected with the headlamp switch inputs, the LCM defaults the exterior lights on.

### Autolamps

The autolamp system provides light sensitive automatic on/off control of the exterior lamps. The autolamp system keeps the exterior lamps on for a pre-selected period of time after the ignition switch is turned to the OFF position. The pre-selected time delay is adjustable up to approximately 3 minutes. To adjust the autolamps time delay, refer to Autolamps Time Delay Adjustment in this section.

Vehicles equipped with autolamps also have a feature that turns on the exterior lamps when the wipers are on. For diagnostics of the headlamps on with wipers on feature, refer to [Section 501-16](#).

### **Stoplamps**

The stoplamps are supplied voltage directly from the stoplamp switch when the brake pedal is applied.

### **Turn Signal/Hazard and Cornering Lamps**

When the multifunction switch is placed in the LH or RH TURN position, the multifunction switch routes voltage to the LH or RH turn signal lamps. The LCM then cycles the voltage on and off approximately 80 times per minute. If a front or rear turn bulb is inoperative, the LCM cycles the voltage on and off approximately 160 times per minute.

The hazard flasher lamp switch is integral to the multifunction switch. When the hazard flasher lamp switch is engaged, the multifunction switch supplies voltage to all the turn lamps. The LCM cycles the voltage on and off approximately 80 times per minute.

When the multifunction switch is placed in the LH or RH TURN position and the parking lamps are on, the multifunction switch provides a ground for the cornering lamps.

### **Parking Lamps**

The LCM supplies voltage to the parking lamps when demanded, such as when the parking lamp switch is in the PARKING LAMPS ON position or when the autolamps feature has requested the exterior lamps on.

### **Fog Lamps**

The fog lamp switch is integral to the headlamp switch. When the fog lamp switch is engaged, voltage is routed to the fog lamp relay coil, which then energizes and routes voltage to the fog lamps. The fog lamps can be turned on when the ignition switch is in the RUN or ACC position, the parking lamps are on, and the high beam headlamps are off.

### **Reversing Lamps**

When the transmission is placed in REVERSE (R), the digital Transmission Range (TR) sensor routes voltage to the reversing lamps.

### **Police Option**

In addition to the previous listed components, a police option vehicle may include the following:

- Police glove compartment relay/fuse center
- Police luggage compartment relay/fuse center
- Package tray lamps
- Decklid flashing lamps
- Alternating flashing headlamps
- Rear deck LED flasher
- Strobe lamps

### **Daytime Running Lamps (DRL)**

The Daytime Running Lamps (DRL) system is designed to turn the high beam headlamps on at a reduced intensity when the following conditions are met:

- The ignition switch is in the RUN position.
- The headlamps have not been commanded on from any other input.
- The vehicle is not in PARK (P).

The DRL system remains active until the autolamp system turns on the headlamps or the headlamp switch is turned to the HEADLAMPS ON position.

The high beams are illuminated at full intensity when flash-to-pass mode is requested.

The LCM can be configured to turn the DRL on for this vehicle. Refer to Section 418-01 for information on this programmable parameter.

---

**Diagnostic Trouble Code (DTC) Chart****Lighting Control Module (LCM) DTC Chart**

<b>DTC</b>	<b>Description</b>	<b>Action</b>
B1449	Wiper Park Sense Circuit Short to Ground	<u>GO to Pinpoint Test G</u> .
B1472	Lamp Headlamp Input Circuit Short to Ground	<u>GO to Pinpoint Test D</u> .
B1485	Brake Pedal Input Circuit Short to Battery	REFER to <u>Section 307-05</u> .
B1570	Lamp Headlamp High-Beam Circuit Short to Ground	<u>GO to Pinpoint Test D</u> .
B1578	Lamp Park Input Short to Ground	<u>GO to Pinpoint Test Q</u> .
B1696	Autolamp On Circuit Short to Ground	<u>GO to Pinpoint Test G</u> .
B1873	Turn Signal/Hazard Power Feed Short to Ground	<u>GO to Pinpoint Test K</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

**Driver Door Module (DDM) DTC Chart**




<b>DTC</b>	<b>Description</b>	<b>Action</b>
B1153	Police Wigwag Lighting Input Circuit Short to Ground	<u>GO to Pinpoint Test A</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .





**Headlamps**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

**NOTE:** Due to varying wattage ratings and resulting current draw, certain aftermarket headlamp bulbs may cause the Lighting Control Module (LCM) to shut down the short circuit protection, resulting in the low beams becoming inoperative. Verify that the headlamp bulbs meet Ford specifications.

The LCM receives inputs from the following:

- Headlamp switch
- Multifunction switch

Depending on the inputs received, the LCM commands the headlamps on or off.

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Headlamp switch</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):</li> </ul>

<ul style="list-style-type: none"> <li>• Multifunction switch</li> </ul>	<ul style="list-style-type: none"> <li>◆ 19 (10A) (LH low beam)</li> <li>◆ 21 (10A) (RH low beam)</li> <li>◆ 23 (15A) (high beams)</li> <li>• Wiring, terminals or connectors</li> <li>• Headlamp bulb</li> <li>• Driver Door Module (DDM)</li> <li>• Lighting Control Module (LCM)</li> </ul>
--	--

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to [Section 418-00](#) , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to [Section 418-00](#) to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#) .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the DDM and LCM .

9. If the DTCs retrieved are related to the concern, refer to [Diagnostic Trouble Code \(DTC\) Chart](#) in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in [Section 419-10](#) .

10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#) .

## Symptom Chart

### Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: Both High Beams Are Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

**NOTE:** If only the flash-to-pass is inoperative, GO to Pinpoint Test E .

#### Normal Operation

The Lighting Control Module (LCM) and the multifunction switch are supplied voltage from the Central Junction Box (CJB). The LCM sends a voltage signal to the multifunction switch. When the multifunction switch is placed in the HIGH BEAM position, the signal is routed to ground, pulling the voltage signal low.

When the LCM detects a request for the high beams (signal pulled low), the LCM provides voltage to the high beam headlamps.

For police interceptor vehicles, when the Driver Door Module (DDM) receives a ground signal from the wig-wag module (non-fleet) or the R2.A3 relay (fleet) (located in the police glove box relay center), the DDM sends a message to the LCM to disable the high beams.

- DTC B1153 (Police Wigwag Lighting Input Circuit Short to Ground) - an on-demand DTC that sets when the DDM detects a short to ground from the wig-wag module input circuit.

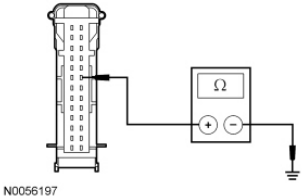
**This pinpoint test is intended to diagnose the following:**

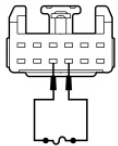
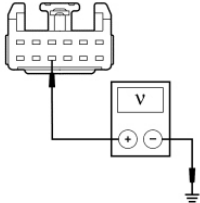
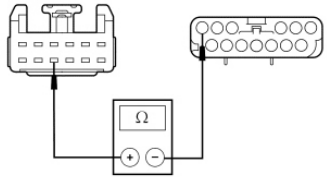
- Fuse
- Wiring, terminals or connectors
- Multifunction switch
- DDM
- Wig-wag module
- LCM

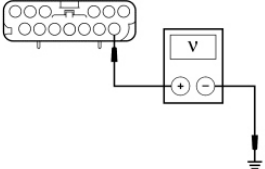
#### PINPOINT TEST A: BOTH HIGH BEAMS ARE INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>A1 CHECK THE RECORDED RESULTS FROM THE DDM SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the recorded results from the DDM self-test.</li> <li>• Is DTC B1153 present?</li> </ul>	<b>Yes</b> GO to <u>A2</u> .  <b>No</b> GO to <u>A4</u> .
<b>A2 CHECK THE WIG-WAG MODULE (NON-FLEET) OR THE R2.A3 RELAY (FLEET)</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Wig-Wag Module C1352 (Non-Fleet) or R2.A3 Relay (Fleet).</li> <li>• Ignition ON.</li> <li>• Clear the DTCs and repeat the on-demand DDM self-test.</li> <li>• <b>Is DTC B1153 present?</b></li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> INSTALL a new wig-wag module (non-fleet) or R2.A3 relay (fleet). TEST the system for normal operation.</p>
<b>A3 CHECK THE DDM HIGH BEAM DISABLE SIGNAL CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between the DDM C501a-21, circuit 165 (TN/WH), harness side and ground.</li> </ul>  <p>N0056197</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A10</u> .</p> <p><b>No</b> REPAIR circuit 165 (TN/WH) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<b>A4 CHECK THE HIGH BEAM INDICATOR OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• Place the multifunction switch in the HIGH BEAM position.</li> <li>• <b>Does the high beam indicator illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>A8</u> .</p> <p><b>No</b> GO to <u>A5</u> .</p>
<b>A5 BYPASS THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202a.</li> <li>• Connect a fused jumper wire between the multifunction switch C202a-10, circuit 12 (LG/BK), harness side and C202a-9, circuit 57 (BK), harness side.</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>A6</u> .</p>

 <p>N0043373</p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• <b>Is the high beam indicator illuminated?</b></li> </ul>	
<p><b>A6 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH</b></p>	
<ul style="list-style-type: none"> <li>• Measure the voltage between the multifunction switch C202a-10, circuit 12 (LG/BK), harness side and ground.</li> </ul>  <p>N0088211</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage approximately 5 volts?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>A7</u> .</p>
<p><b>A7 CHECK THE HIGH BEAM REQUEST INPUT CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145d.</li> <li>• Measure the resistance between the multifunction switch C202a-10, circuit 12 (LG/BK), harness side and the LCM C2145d-26, circuit 12 (LG/BK), harness side.</li> </ul>  <p>N0040926</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>A9</u> .</p> <p><b>No</b> REPAIR circuit 12 (LG/BK) for an open. TEST the system for normal operation.</p>
<p><b>A8 CHECK FOR VOLTAGE TO THE LCM</b></p>	

<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Measure the voltage between the LCM C2145c-1, circuit 910 (PK), harness side and ground.</li> </ul>  <p>N0040928</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">A9</a> .</p> <p><b>No</b> VERIFY the CJB fuse 24 (15A) is OK. If OK, REPAIR circuit 910 (PK) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<p><b>A9 CHECK FOR CORRECT LCM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<p><b>A10 CHECK FOR CORRECT DDM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test B: One Low Beam Headlamp Is Inoperative

Refer to Wiring Diagrams Cell [85](#) , Headlamps/Autolamps for schematic and connector information.

**Normal Operation**

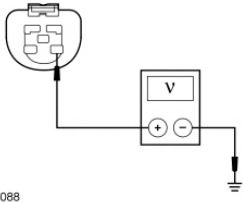
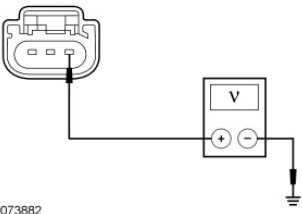
The Lighting Control Module (LCM) is supplied voltage from the Central Junction Box (CJB) for the LH low beam and for the RH low beam on separate circuits. When a request for the low beams is received by the LCM, the LCM provides voltage to the LH and RH headlamps.

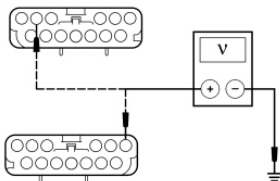
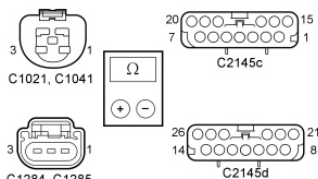
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- LCM

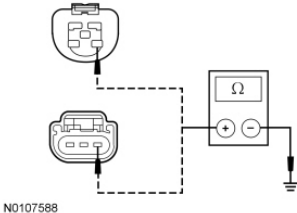
**PINPOINT TEST B: ONE LOW BEAM HEADLAMP IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>B1 CHECK FOR VOLTAGE TO THE INOPERATIVE HEADLAMPS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Headlamp.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• For Crown Victoria, measure the voltage between the LH headlamp C1021-1, circuit 160 (DB/WH), harness side and ground; or between the RH headlamp C1041-1, circuit 161 (DG/OG), harness side and ground</li> </ul>  <ul style="list-style-type: none"> <li>• For Grand Marquis, measure the voltage between the LH headlamp C1284-1, circuit 160 (DB/WH), harness side and ground; or between the RH headlamp C1285-1, circuit 161 (DG/OG), harness side and ground</li> </ul> 	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>B2</u>.</p>

<ul style="list-style-type: none"><li>• Is the voltage greater than 10 volts?</li></ul>																						
<b>B2 CHECK FOR VOLTAGE TO THE LCM</b>																						
<div><ul style="list-style-type: none"><li>• Place the headlamp switch in the OFF position.</li><li>• Disconnect: LCM C2145d (LH Headlamp) or C2145c (RH Headlamp).</li><li>• Measure the voltage between the LCM C2145d-21 (LH low beam), circuit 1055 (WH/LG), harness side and ground; or between the LCM C2145c-19 (RH low beam), circuit 1056 (DB/LG), harness side and ground.</li></ul></div> <div></div> <div><p>N0090199</p><ul style="list-style-type: none"><li>• Is the voltage greater than 10 volts?</li></ul></div>	<div><p><b>Yes</b> GO to <u>B3</u> .</p><p><b>No</b> VERIFY the CJB fuse 19 (10A) or fuse 21 (10A) is OK. If OK, REPAIR circuit 1055 (WH/LG) (LH low beam) or circuit 1056 (DB/LG) (RH low beam) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p></div>																					
<b>B3 CHECK THE HEADLAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>																						
<div><ul style="list-style-type: none"><li>• Measure the resistance between the inoperative headlamp, harness side and the LCM , harness side as follows:</li></ul></div> <div><table><tr><th>Inoperative Headlamp Connector-Pin</th><th>LCM Connector-Pin</th><th>Circuit</th></tr><tr><td colspan="3"><b>Crown Victoria</b></td></tr><tr><td>LH headlamp C1021-1</td><td>C2145d-22</td><td>160 (DB/WH)</td></tr><tr><td>RH headlamp C1041-1</td><td>C2145c-20</td><td>161 (DG/OG)</td></tr><tr><td colspan="3"><b>Grand Marquis</b></td></tr><tr><td>LH headlamp C1284-1</td><td>C2145d-22</td><td>160 (DB/WH)</td></tr><tr><td>RH headlamp C1285-1</td><td>C2145c-20</td><td>161 (DG/OG)</td></tr></table></div> <div></div> <div><p>N0107587</p><ul style="list-style-type: none"><li>• Is the resistance less than 5 ohms?</li></ul></div>	Inoperative Headlamp Connector-Pin	LCM Connector-Pin	Circuit	<b>Crown Victoria</b>			LH headlamp C1021-1	C2145d-22	160 (DB/WH)	RH headlamp C1041-1	C2145c-20	161 (DG/OG)	<b>Grand Marquis</b>			LH headlamp C1284-1	C2145d-22	160 (DB/WH)	RH headlamp C1285-1	C2145c-20	161 (DG/OG)	<div><p><b>Yes</b> GO to <u>B4</u> .</p><p><b>No</b> REPAIR the circuit in question. TEST the system for normal operation.</p></div>
Inoperative Headlamp Connector-Pin	LCM Connector-Pin	Circuit																				
<b>Crown Victoria</b>																						
LH headlamp C1021-1	C2145d-22	160 (DB/WH)																				
RH headlamp C1041-1	C2145c-20	161 (DG/OG)																				
<b>Grand Marquis</b>																						
LH headlamp C1284-1	C2145d-22	160 (DB/WH)																				
RH headlamp C1285-1	C2145c-20	161 (DG/OG)																				



<b>B4 CHECK THE HEADLAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND</b>															
<ul style="list-style-type: none"> <li>• Measure the resistance between the inoperative headlamp, harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Inoperative Headlamp Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td colspan="2"><b>Crown Victoria</b></td></tr> <tr> <td>LH headlamp C1021-1</td><td>160 (DB/WH)</td></tr> <tr> <td>RH headlamp C1041-1</td><td>161 (DG/OG)</td></tr> <tr> <td colspan="2"><b>Grand Marquis</b></td></tr> <tr> <td>LH headlamp C1284-1</td><td>160 (DB/WH)</td></tr> <tr> <td>RH headlamp C1285-1</td><td>161 (DG/OG)</td></tr> </tbody> </table>  <p>N0107588</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	Inoperative Headlamp Connector-Pin	Circuit	<b>Crown Victoria</b>		LH headlamp C1021-1	160 (DB/WH)	RH headlamp C1041-1	161 (DG/OG)	<b>Grand Marquis</b>		LH headlamp C1284-1	160 (DB/WH)	RH headlamp C1285-1	161 (DG/OG)	<p><b>Yes</b> GO to <u>B5</u> .</p> <p><b>No</b> REPAIR the circuit in question. TEST the system for normal operation.</p>
Inoperative Headlamp Connector-Pin	Circuit														
<b>Crown Victoria</b>															
LH headlamp C1021-1	160 (DB/WH)														
RH headlamp C1041-1	161 (DG/OG)														
<b>Grand Marquis</b>															
LH headlamp C1284-1	160 (DB/WH)														
RH headlamp C1285-1	161 (DG/OG)														
<b>B5 CHECK FOR CORRECT LCM OPERATION</b>															
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>														

**Pinpoint Test C: One High Beam Headlamp Is Inoperative**

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

**Normal Operation**

When a request for the high beams is received by the Lighting Control Module (LCM), the LCM provides voltage to the LH and RH headlamps on separate circuits. Ground is shared with the low beam headlamps.

**This pinpoint test is intended to diagnose the following:**

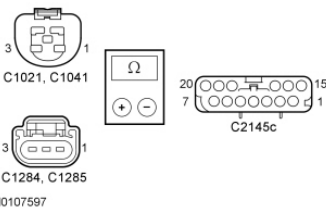
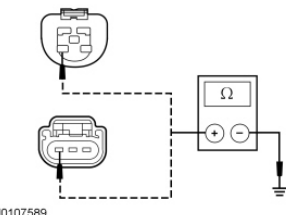
- Wiring, terminals or connectors

- LCM

**PINPOINT TEST C: ONE HIGH BEAM HEADLAMP IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take																					
<b>C1 CHECK THE LOW BEAMS</b>																						
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• <b>NOTE:</b> Make sure the multifunction switch is in the LOW BEAM position.</li><li>• Place the headlamp switch in the HEADLAMPS ON position.</li><li>• <b>Do the low beams operate correctly?</b></li></ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test B</u> .</p>																					
<b>C2 CHECK THE HEADLAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>																						
<ul style="list-style-type: none"><li>• Disconnect: Inoperative Headlamp.</li><li>• Disconnect: LCM C2145c.</li><li>• Measure the resistance between the inoperative headlamp, harness side and the LCM , harness side as follows:</li></ul> <table><tr><th>Inoperative Headlamp Connector-Pin</th><th>LCM Connector-Pin</th><th>Circuit</th></tr><tr><td colspan="3"><b>Crown Victoria</b></td></tr><tr><td>LH headlamp C1021-3</td><td>C2145c-16</td><td>1337 (VT/YE)</td></tr><tr><td>RH headlamp C1041-3</td><td>C2145c-15</td><td>1335 (YE/WH)</td></tr><tr><td colspan="3"><b>Grand Marquis</b></td></tr><tr><td>LH headlamp C1284-3</td><td>C2145c-16</td><td>1337 (VT/YE)</td></tr><tr><td>RH headlamp C1285-3</td><td>C2145c-15</td><td>1335 (YE/WH)</td></tr></table>	Inoperative Headlamp Connector-Pin	LCM Connector-Pin	Circuit	<b>Crown Victoria</b>			LH headlamp C1021-3	C2145c-16	1337 (VT/YE)	RH headlamp C1041-3	C2145c-15	1335 (YE/WH)	<b>Grand Marquis</b>			LH headlamp C1284-3	C2145c-16	1337 (VT/YE)	RH headlamp C1285-3	C2145c-15	1335 (YE/WH)	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> REPAIR the circuit in question for an open. TEST the system for normal operation.</p>
Inoperative Headlamp Connector-Pin	LCM Connector-Pin	Circuit																				
<b>Crown Victoria</b>																						
LH headlamp C1021-3	C2145c-16	1337 (VT/YE)																				
RH headlamp C1041-3	C2145c-15	1335 (YE/WH)																				
<b>Grand Marquis</b>																						
LH headlamp C1284-3	C2145c-16	1337 (VT/YE)																				
RH headlamp C1285-3	C2145c-15	1335 (YE/WH)																				

 <p>• Is the resistance less than 5 ohms?</p>															
<b>C3 CHECK THE HEADLAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND</b>															
<p>• Measure the resistance between the inoperative headlamp, harness side and ground as follows:</p> <table border="1"> <thead> <tr> <th>Inoperative Headlamp Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td colspan="2"><b>Crown Victoria</b></td></tr> <tr> <td>LH headlamp C1021-3</td><td>1337 (VT/YE)</td></tr> <tr> <td>RH headlamp C1041-3</td><td>1335 (YE/WH)</td></tr> <tr> <td colspan="2"><b>Grand Marquis</b></td></tr> <tr> <td>LH headlamp C1284-3</td><td>1337 (VT/YE)</td></tr> <tr> <td>RH headlamp C1285-3</td><td>1335 (YE/WH)</td></tr> </tbody> </table>  <p>• Is the resistance greater than 10,000 ohms?</p>	Inoperative Headlamp Connector-Pin	Circuit	<b>Crown Victoria</b>		LH headlamp C1021-3	1337 (VT/YE)	RH headlamp C1041-3	1335 (YE/WH)	<b>Grand Marquis</b>		LH headlamp C1284-3	1337 (VT/YE)	RH headlamp C1285-3	1335 (YE/WH)	<p><b>Yes</b> GO to <u>C4</u> .</p> <p><b>No</b> REPAIR the circuit in question for a short to ground. TEST the system for normal operation.</p>
Inoperative Headlamp Connector-Pin	Circuit														
<b>Crown Victoria</b>															
LH headlamp C1021-3	1337 (VT/YE)														
RH headlamp C1041-3	1335 (YE/WH)														
<b>Grand Marquis</b>															
LH headlamp C1284-3	1337 (VT/YE)														
RH headlamp C1285-3	1335 (YE/WH)														
<b>C4 CHECK FOR CORRECT LCM OPERATION</b>															
<p>• Disconnect all the LCM connectors.</p> <p>• Check for:</p> <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> <p>• Connect all the LCM connectors and make sure they seat correctly.</p> <p>• Operate the system and verify the concern is still present.</p> <p>• Is the concern still present?</p>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>														

**Pinpoint Test D: The Headlamps Are On Continuously**

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

### Normal Operation

The Lighting Control Module (LCM) sends voltage signals to the headlamp switch. The headlamp switch always routes one of the signal circuits to ground for any given headlamp switch position. If the LCM detects a fault with the headlamp switch input, the LCM defaults the exterior lamps on.

When the LCM detects the headlamp switch in the HEADLAMPS ON position and the multifunction switch in the LOW BEAM position, the LCM provides voltage to the LH and RH low beam headlamps.

The LCM sends a 5 volt signal to the multifunction switch. When the multifunction switch is placed in the HIGH BEAM position, the voltage signal is routed to ground, pulling the signal low. When the multifunction switch is placed in the FLASH-TO-PASS position, battery voltage is routed to the LCM , pulling the signal high. When the LCM detects a request for the flash-to-pass or high beam headlamps, the LCM provides voltage to the high beam headlamps.

When the LCM detects the headlamp switch in the HEADLAMPS ON position and the multifunction switch in the HIGH BEAM or FLASH-TO-PASS position, the LCM provides voltage to the LH and RH high beam headlamps.

When the LCM detects the wipers are on for a predetermined amount of time, the LCM provides voltage to the exterior lamps.

- DTC B1472 (Lamp Headlamp Input Circuit Short to Ground) - an on-demand DTC that sets when the LCM detects a short to ground from the headlamps on input circuit.
- DTC B1570 (Lamp Headlamp High-Beam Circuit Short to Ground) - an on-demand DTC that sets when the LCM detects a short to ground from the high beam request input circuit.

### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Headlamp switch
- Multifunction switch
- Wig-wag module
- LCM

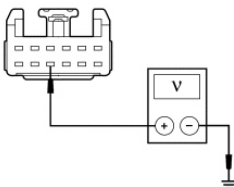
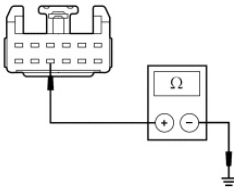
### PINPOINT TEST D: THE HEADLAMPS ARE ON CONTINUOUSLY

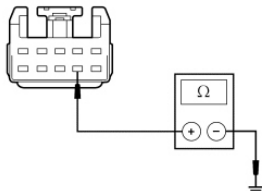
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

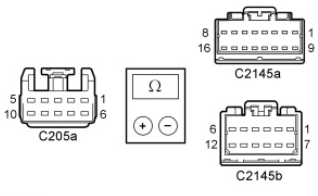
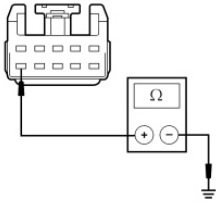
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>D1 DETERMINE IF THE HIGH BEAMS ARE ILLUMINATED</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> </ul>	<b>Yes</b> GO to <u>D7</u> .  <b>No</b>

<ul style="list-style-type: none"> <li>Place the multifunction switch in the FLASH-TO-PASS position while observing the headlamps.</li> <li><b>Does the headlamp brightness increase?</b></li> </ul>	GO to <u>D2</u> .
<b>D2 CHECK THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>Disconnect: Multifunction Switch C202c.</li> <li><b>Do the high beam headlamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . CLEAR the DTCs. REPEAT the self-test.</p>
<b>D3 CHECK THE HIGH BEAM VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: LCM C2145c.</li> <li>Ignition ON.</li> <li><b>Do the high beam headlamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> For police vehicles, GO to <u>D4</u> .</p> <p>For all others, REPAIR circuit 1337 (VT/YE) (LH high beam) or circuit 1335 (YE/WH) (RH high beam) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>D5</u> .</p>
<b>D4 CHECK THE HIGH BEAM VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE (POLICE VEHICLES)</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Wig-Wag Module C1352 or C1365.</li> <li>Ignition ON.</li> <li><b>Do the high beam headlamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 1337 (VT/YE) (LH high beam) or circuit 1335 (YE/WH) (RH high beam) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new wig-wag module. CLEAR the DTCs. REPEAT the self-test.</p>
<b>D5 CHECK THE HIGH BEAM REQUEST INPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>Place the headlamp switch in the OFF position.</li> <li>Ignition OFF.</li> <li>Disconnect: LCM C2145d.</li> <li>Ignition ON.</li> <li>Measure the voltage between the multifunction switch C202c-10, circuit 12 (LG/BK), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 12 (LG/BK) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>D6</u> .</p>

 <p>N0040934</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<b>D6 CHECK THE HIGH BEAM REQUEST INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the multifunction switch C202c-10, circuit 12 (LG/BK), harness side and ground.</li> </ul>  <p>N0040933</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D14</u> .</p> <p><b>No</b> REPAIR circuit 12 (LG/BK) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<b>D7 CHECK FOR AUTOLAMP SYSTEM DTCs</b>	
<ul style="list-style-type: none"> <li>• Review the DTCs retrieved from the LCM self-test.</li> <li>• Was DTC B1449 or DTC B1696 retrieved?</li> </ul>	<p><b>Yes</b> REFER to <u>Autolamps</u> in this section.</p> <p><b>No</b> GO to <u>D8</u> .</p>
<b>D8 CHECK THE LCM HEADLAMP SWITCH PIDs</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM headlamp switch status PIDs (HLMPOFF, PARK_SW, HD_LMP_SW) while moving the headlamp switch through all positions.</li> <li>• Do the headlamp switch PIDs agree with the headlamp switch position?</li> </ul>	<p><b>Yes</b> GO to <u>D9</u> .</p> <p><b>No</b> GO to <u>D10</u> .</p>
<b>D9 CHECK THE LCM LOW BEAM OUTPUT CIRCUITS FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c and C2145d.</li> <li>• Ignition ON.</li> <li>• Do the low beam headlamps continue to illuminate?</li> </ul>	<p><b>Yes</b> REPAIR circuit 160 (DB/WH) (LH low beam) or circuit 161 (DG/OG) (RH low beam). CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>D14</u> .</p>

<b>D10 CHECK THE HEADLAMP SWITCH</b>														
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Headlamp Switch C205a.</li><li>• Carry out the headlamp switch component test.</li></ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"><li>• <b>Is the headlamp switch OK?</b></li></ul>		<p><b>Yes</b> GO to <u>D11</u> .</p> <p><b>No</b> INSTALL a new headlamp switch. REFER to <u>Headlamp Switch</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p>												
<b>D11 CHECK THE HEADLAMP SWITCH GROUND CIRCUIT FOR AN OPEN</b>														
<ul style="list-style-type: none"><li>• Disconnect: Negative Battery Cable.</li><li>• Measure the resistance between the headlamp switch C205a-7, circuit 57 (BK) harness side and ground</li></ul> <div><p>N0043371</p></div> <ul style="list-style-type: none"><li>• <b>Is the resistance less than 5 ohms?</b></li></ul>		<p><b>Yes</b> GO to <u>D12</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. CLEAR the DTCs. REPEAT the self-test.</p>												
<b>D12 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR AN OPEN</b>														
<ul style="list-style-type: none"><li>• Disconnect: LCM C2145a and C2145b.</li><li>• Measure the resistance between the headlamp switch, harness side and the LCM , harness side as follows:</li></ul> <table border="1"><thead><tr><th>Headlamp Switch Connector-Pin</th><th>LCM Connector-Pin</th><th>Circuit</th></tr></thead><tbody><tr><td>C205a-9</td><td>C2145b-2</td><td>1400 (TN/WH)</td></tr><tr><td>C205a-5</td><td>C2145a-9</td><td>1032 (WH/BK)</td></tr><tr><td>C205a-10</td><td>C2145a-3</td><td>1033 (RD/YE)</td></tr></tbody></table>		Headlamp Switch Connector-Pin	LCM Connector-Pin	Circuit	C205a-9	C2145b-2	1400 (TN/WH)	C205a-5	C2145a-9	1032 (WH/BK)	C205a-10	C2145a-3	1033 (RD/YE)	<p><b>Yes</b> GO to <u>D13</u> .</p> <p><b>No</b> REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
Headlamp Switch Connector-Pin	LCM Connector-Pin	Circuit												
C205a-9	C2145b-2	1400 (TN/WH)												
C205a-5	C2145a-9	1032 (WH/BK)												
C205a-10	C2145a-3	1033 (RD/YE)												

 <p>N0107497</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	
<b>D13 CHECK THE HEADLAMPS ON INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the headlamp switch C205a-10, circuit 1033 (RD/YE), harness side and ground.</li> </ul>  <p>N0084272</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>D14</u> .</p> <p><b>No</b> REPAIR circuit 1033 (RD/YE) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<b>D14 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test E: The Flash-To-Pass Feature Is Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

#### Normal Operation

The multifunction switch is supplied voltage from the Central Junction Box (CJB). When the multifunction switch is placed in the FLASH-TO-PASS position, the voltage is routed to the Lighting Control Module (LCM).

The LCM sends a 5 volt signal to the multifunction switch. When the multifunction switch is placed in the FLASH-TO-PASS position, battery voltage is routed through to the LCM , pulling the signal high. When the LCM detects a request for flash-to-pass, the LCM provides voltage to the high beam headlamps.

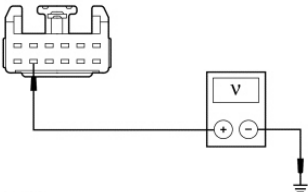


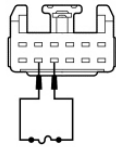
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Multifunction switch
- LCM

**PINPOINT TEST E: THE FLASH-TO-PASS FEATURE IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>E1 CHECK THE HIGH BEAM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• Place the multifunction switch in the HIGH BEAM position.</li> <li>• <b>Do the high beam headlamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> GO to <u>Pinpoint Test A</u> .</p>
<b>E2 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202c.</li> <li>• Measure the voltage between the multifunction switch C202c-11, circuit 910 (PK), harness side and ground.</li> </ul>  <p>A0048277</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>E3</u> .</p> <p><b>No</b> REPAIR circuit 910 (PK) for an open. TEST the system for normal operation.</p>
<b>E3 BYPASS THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the multifunction switch C202c-11, circuit 910 (PK), harness side and the multifunction switch C202c-10, circuit 12 (LG/BK), harness side.</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>E4</u> .</p>



N0040925

- **Are the high beams illuminated?**

**E4 CHECK FOR CORRECT LCM OPERATION**

- Disconnect all the LCM connectors.
- Check for:
  - ◆ corrosion
  - ◆ damaged pins
  - ◆ pushed-out pins
- Connect all the LCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

**Yes**




INSTALL a new LCM . REFER to Section 419-10 . TEST the system for normal operation.

**No**

The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

**Autolamps**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The light sensor must always be exposed to outside light to function correctly. Do not place any items on the defroster grille panel which may block light to the light sensor and cause erratic operation of the system.

The autolamp time delay control defaults to 20 seconds unless changed by the operator.

Placing the headlamp switch in any other position overrides the autolamps operation. Automatic operation is not possible until the headlamp switch is placed in the AUTOLAMPS ON position.

There is also a feature that turns on the exterior lamps when the windshield wipers are turned on. When the LCM detects a ground signal from the windshield wiper motor (for a predetermined amount of time), the LCM turns the exterior lamps on.

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical

<ul style="list-style-type: none"> <li>• Headlamp switch</li> </ul>	<ul style="list-style-type: none"> <li>• Wiring, terminals or connectors</li> <li>• Lighting Control Module (LCM)</li> <li>• Light sensor</li> </ul>
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3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .

9. If the DTCs retrieved are related to the concern, refer to Diagnostic Trouble Code (DTC) Chart in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test F: The Autolamps Are Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

**Normal Operation**

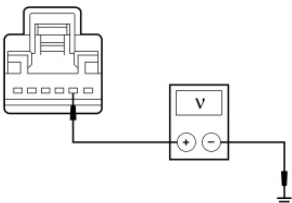
When a request for the autolamps is detected by the Lighting Control Module (LCM), the LCM sends a voltage signal to the light sensor. When high ambient light conditions exist, the light sensor pulls the voltage signal low. When low ambient light conditions exist, the voltage signal to the light sensor is read high by the LCM. Based on input from the light sensor, the LCM determines when to supply voltage to the exterior lamps.

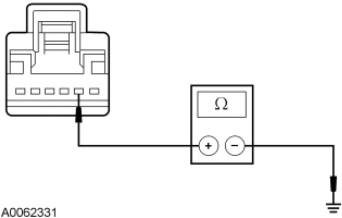
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Light sensor
- LCM

**PINPOINT TEST F: THE AUTOLAMPS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>F1 CHECK THE MANUAL HEADLAMP AND PARKING LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• <b>Do the headlamps and parking lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>F2</u>.</p> <p><b>No</b> REFER to <u>Headlamps</u> or <u>Parking, Rear and License Plate Lamps</u> in this section.</p>
<b>F2 CHECK FOR VOLTAGE TO THE LIGHT SENSOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Light Sensor C287.</li> <li>• Ignition ON.</li> <li>• Place the headlamp switch in the AUTOLAMPS ON position.</li> <li>• Measure the voltage between the light sensor C287-2, circuit 218 (WH/VT), harness side and ground.</li> </ul>  <p>N0043374</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage approximately 5 volts?</b></li> </ul>	<p><b>Yes</b> INSTALL a new light sensor. REFER to <u>Light Sensor</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>F3</u>.</p>
<b>F3 CHECK THE LIGHT SENSOR INPUT CIRCUIT FOR A SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Measure the resistance between the light sensor C287-2, circuit 218 (WH/VT), harness side and ground.</li> </ul>  <p><b>• Is the resistance greater than 10,000 ohms?</b></p>	<p><b>Yes</b> GO to <b>F4</b> .</p> <p><b>No</b> REPAIR circuit 218 (WH/VT) for a short to ground. TEST the system for normal operation.</p>
<b>F4 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <b>Section 419-10</b> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test G: The Autolamps Are On Continuously

Refer to Wiring Diagrams Cell **85** , Headlamps/Autolamps for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) sends a voltage signal to the headlamp switch. When the headlamp switch is in the AUTOLAMPS ON position, the signal is routed to ground.

When a request for the autolamps is detected by the LCM , the LCM monitors the light sensor. When high ambient light conditions exist, the light sensor pulls the voltage signal low. When low ambient light conditions exist, the voltage signal to the light sensor is read high by the LCM . Based on input from the light sensor, the LCM determines when to supply voltage to the exterior lamps.

The LCM also sends a voltage signal to the windshield wiper motor. When the wiper motor is on, the signal is routed to ground.

- DTC B1449 (Wiper Park Sense Circuit Short to Ground) - an on-demand DTC that sets when the LCM detects a short to ground from the wipers on input circuit.
- DTC B1696 (Autolamp On Circuit Short to Ground) - an on-demand DTC that sets when the LCM detects a short to ground from the autolamps lamps on input circuit.

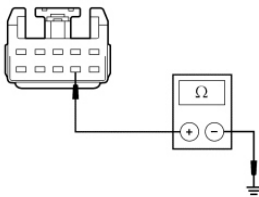
**This pinpoint test is intended to diagnose the following:**

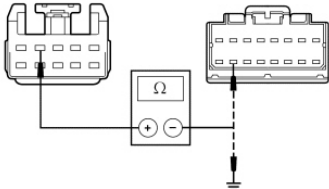
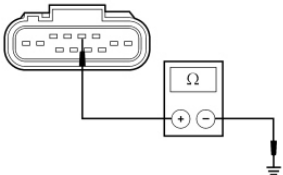
- Wiring, terminals or connectors

- Light sensor
- Headlamp switch
- Windshield wiper motor
- LCM

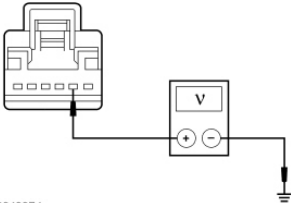
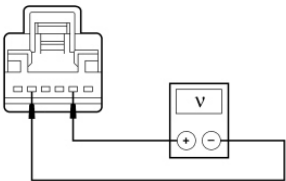
**PINPOINT TEST G: THE AUTOLAMPS ARE ON CONTINUOUSLY**

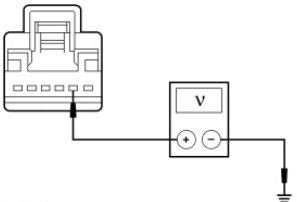
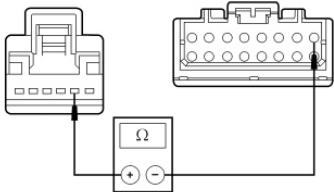
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>G1 CHECK THE LCM HEADLAMP SWITCH PIDs</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM headlamp switch PIDs (HLMPOFF and AUTOLMP) while moving the headlamp switch to the AUTOLAMPS ON and OFF positions.</li> <li>• <b>Do the headlamp switch positions agree with the PIDs?</b></li> </ul>	<p><b>Yes</b> GO to <u>G5</u> .</p> <p><b>No</b> GO to <u>G2</u> .</p>
<b>G2 CHECK THE HEADLAMP SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Headlamp Switch C205a.</li> <li>• Carry out the headlamp switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Is the headlamp switch OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>G3</u> .</p> <p><b>No</b> INSTALL a new headlamp switch. REFER to <u>Headlamp Switch</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p>
<b>G3 CHECK THE HEADLAMP SWITCH GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the headlamp switch C205a-7, circuit 57 (BK) harness side and ground.</li> </ul>  <p>N0043371</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>G4</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. CLEAR the DTCs. REPEAT the self-test.</p>
<b>G4 CHECK THE AUTOLAMPS ON INPUT CIRCUIT FOR AN OPEN AND SHORT TO GROUND</b>	

<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145a.</li> <li>• Measure the resistance between the headlamp switch C205a-4, circuit 220 (VT/OG), harness side and the LCM C2145a-15, circuit 220 (VT/OG), harness side: and between the headlamp switch C205a-4, circuit 220 (VT/OG), harness side and ground.</li> </ul>  <p>N0088214</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms between the headlamp switch and the LCM , and greater than 10,000 ohms between the headlamp switch and ground?</b></li> </ul>	<p><b>Yes</b> GO to <u>G13</u> .</p> <p><b>No</b> REPAIR circuit 220 (VT/OG). CLEAR the DTCs. REPEAT the self-test.</p>
<b>G5 CHECK THE LCM WINDSHIELD WIPER MOTOR INPUT</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM windshield wiper motor PID (WPRMTRST1).</li> <li>• <b>Does the PID indicate the windshield wiper motor is active?</b></li> </ul>	<p><b>Yes</b> GO to <u>G6</u> .</p> <p><b>No</b> GO to <u>G8</u> .</p>
<b>G6 CHECK THE WINDSHIELD WIPER MOTOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Windshield Wiper Motor C125.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM windshield wiper motor PID (WPRMTRST1).</li> <li>• <b>Does the PID indicate the windshield wiper motor is active?</b></li> </ul>	<p><b>Yes</b> GO to <u>G7</u> .</p> <p><b>No</b> INSTALL a new windshield wiper motor. REFER to <u>Section 501-16</u> . CLEAR the DTCs. REPEAT the self-test.</p>
<b>G7 CHECK THE WIPERS ON INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145d.</li> <li>• Measure the resistance between the windshield wiper motor C125-2, circuit 28 (BK/PK), harness side and ground.</li> </ul>  <p>N0046955</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>G13</u> .</p> <p><b>No</b> REPAIR circuit 28 (BK/PK) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>





<b>G8 CHECK FOR DTC B1472</b>	
<ul style="list-style-type: none"> <li>• Review the DTCs retrieved from the LCM self-test.</li> <li>• <b>Was DTC B1472 retrieved?</b></li> </ul>	<p><b>Yes</b> GO to <u>Pinpoint Test D</u> .</p> <p><b>No</b> GO to <u>G9</u> .</p>
<b>G9 CHECK FOR VOLTAGE TO THE LIGHT SENSOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Light Sensor C287.</li> <li>• Ignition ON.</li> <li>• Place the headlamp switch in the AUTOLAMPS ON position.</li> <li>• Measure the voltage between the light sensor C287-2, circuit 218 (WH/VT), harness side and ground.</li> </ul>  <p>N0043374</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage approximately 5 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>G10</u> .</p> <p><b>No</b> GO to <u>G11</u> .</p>
<b>G10 CHECK FOR VOLTAGE TO THE LIGHT SENSOR USING THE CONNECTOR GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between the light sensor C287-2, circuit 218 (WH/VT), harness side and the light sensor C287-5, circuit 676 (PK/OG), harness side.</li> </ul>  <p>N0088215</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage approximately 5 volts?</b></li> </ul>	<p><b>Yes</b> INSTALL a new light sensor. REFER to <u>Light Sensor</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> REPAIR circuit 676 (PK/OG) for an open. CLEAR the DTCs. REPEAT the self-test.</p>
<b>G11 CHECK THE LIGHT SENSOR INPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the light sensor C287-2, circuit 218 (WH/VT), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 218 (WH/VT) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>G12</u> .</p>

 <p>N0043374</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<b>G12 CHECK THE LIGHT SENSOR INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the light sensor C287-2, circuit 218 (WH/VT), harness side and the LCM C2145a-1, circuit 218 (WH/VT), harness side.</li> </ul>  <p>N0043376</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>G13</u> .</p> <p><b>No</b> REPAIR circuit 218 (WH/VT) for an open. CLEAR the DTCs. REPEAT the self-test.</p>
<b>G13 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>



**Stoplamps**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

**NOTE:** The stoplamps are powered directly from the stoplamp switch, not from the Lighting Control Module (LCM).

The stoplamps are supplied voltage from the stoplamp switch. When the brake pedal is applied, the internal switch closes and voltage is supplied directly to the high mounted stoplamp and the multifunction switch, which then routes the voltage to the rear stoplamps.

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Stoplamp switch</li> <li>• Multifunction switch</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 14 (20A) (stoplamp switch)</li> <li>• Wiring, terminals or connectors</li> <li>• Bulb(s)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom. GO to **Symptom Chart** .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test H: All The Stoplamps Are Inoperative

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

#### Normal Operation

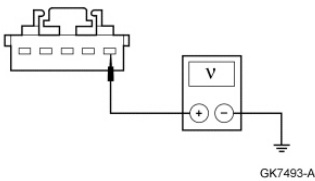
The Battery Junction Box (BJB) supplies voltage to the stoplamp switch. When the brake pedal is applied, the stoplamp switch closes and routes voltage to the stoplamps.

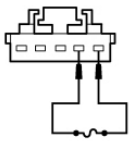
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Fuse
- Stoplamp switch

#### PINPOINT TEST H: ALL THE STOPLAMPS ARE INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>H1 CHECK FOR VOLTAGE TO THE STOPLAMP SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Stoplamp Switch C278.</li> <li>• Measure the voltage between the stoplamp switch C278-1, circuit 1119 (RD), harness side and ground.</li> </ul>  <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>H2</u> .</p> <p><b>No</b> VERIFY the BJB fuse 14 (20A) is OK. If OK, REPAIR circuit 1119 (RD) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>H2 BYPASS THE STOPLAMP SWITCH</b>	

<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the stoplamp switch C278-1, circuit 1119 (RD), harness side and the stoplamp switch C278-2, circuit 10 (LG/RD), harness side.</li> </ul>  <p>A0079391</p> <ul style="list-style-type: none"> <li>• <b>Do the stoplamps illuminate?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new stoplamp switch. REFER to <u>Stoplamp Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 10 (LG/RD) for an open. TEST the system for normal operation.</p>
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### Pinpoint Test I: One Or More Stoplamps Are Inoperative

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

#### Normal Operation

When the brake pedal is applied, the stoplamp switch closes and routes voltage to the high mounted stoplamp and the multifunction switch. The multifunction switch then routes the voltage to the LH and RH stoplamps.

**This pinpoint test is intended to diagnose the following:**

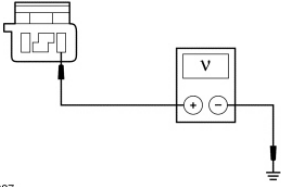
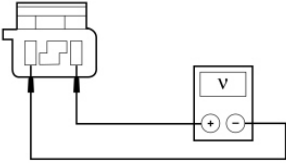
- Wiring, terminals or connectors
- High mounted stoplamp
- Multifunction switch

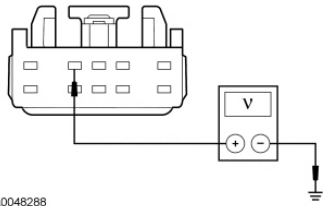
#### PINPOINT TEST I: ONE OR MORE STOPLAMPS ARE INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>I1 CHECK THE HIGH MOUNTED STOPLAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Apply the brake pedal.</li> <li>• <b>Does the high mounted stoplamp illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>I4</u> .</p> <p><b>No</b> GO to <u>I2</u> .</p>
<b>I2 CHECK FOR VOLTAGE TO THE HIGH MOUNTED STOPLAMP</b>	

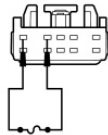
<ul style="list-style-type: none"> <li>• Disconnect: High Mounted Stoplamp C475.</li> <li>• While applying the brake pedal, measure the voltage between the high mounted stoplamp C475-1, circuit 10 (LG/RD), harness side and ground.</li> </ul>  <p>A0048287</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>I3</u> .</p> <p><b>No</b> REPAIR circuit 10 (LG/RD) for an open. TEST the system for normal operation.</p>
<b>I3 CHECK FOR VOLTAGE TO THE HIGH MOUNTED STOPLAMP USING THE CONNECTOR GROUND</b>	
<ul style="list-style-type: none"> <li>• While applying the brake pedal, measure the voltage between the high mounted stoplamp C475-1, circuit 10 (LG/RD), harness side and the high mounted stoplamp C475-2, circuit 57 (BK), harness side.</li> </ul>  <p>N0107590</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> INSTALL a new high mounted stoplamp. REFER to <u>High Mounted Stoplamp</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<b>I4 DETERMINE IF THE LH AND RH REAR STOPLAMPS ARE INOPERATIVE</b>	
<p><b>NOTE:</b> Make sure the multifunction switch is in the NEUTRAL position.</p> <ul style="list-style-type: none"> <li>• Apply the brake pedal.</li> <li>• Are both the LH and RH rear stoplamps inoperative?</li> </ul>	<p><b>Yes</b> GO to <u>I5</u> .</p> <p><b>No</b> GO to <u>I7</u> .</p>
<b>I5 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Multifunction Switch C202a.</li> <li>• While applying the brake pedal, measure the voltage between the multifunction switch C202a-4, circuit 10 (LG/RD), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>I6</u> .</p> <p><b>No</b> REPAIR circuit 10 (LG/RD) for an open. TEST the system for normal operation.</p>



- Is the voltage greater than 10 volts?

#### I6 BYPASS THE MULTIFUNCTION SWITCH (BOTH REAR STOPLAMPS)

- Connect a fused jumper wire between the multifunction switch C202a-4, circuit 10 (LG/RD), harness side and the multifunction switch C202a-5, circuit 5 (OG/LB), harness side.



- Apply the brake pedal while observing the RH rear stoplamps.
- Do the RH rear stoplamps illuminate?

#### Yes

REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to Section 211-05 . TEST the system for normal operation.

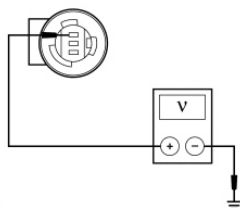
#### No

REMOVE the jumper wire. REPAIR circuit 57 (BK) for an open to the rear lamps. TEST the system for normal operation.

#### I7 CHECK FOR VOLTAGE TO THE REAR STOPLAMP

- Disconnect: Inoperative Stoplamp.
- Measure the voltage between the inoperative stoplamp, harness side and ground as follows:

Inoperative Stoplamp	Connector-Pin	Circuit
LH	C4112-1	57 (BK)
LH	C4113-1	57 (BK)
RH	C4114-1	57 (BK)
RH	C4115-1	57 (BK)



- Is the voltage greater than 10 volts?

#### Yes

REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.

#### No

GO to I8 .



I8 CHECK THE MULTIFUNCTION SWITCH	
<ul style="list-style-type: none"> <li>• Disconnect: Multifunction Switch.</li> <li>• Carry out the multifunction switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Is the multifunction switch OK?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 9 (LG/OG) (LH stoplamp) or circuit 5 (OG/LB) (RH stoplamp) as necessary. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p>

**Pinpoint Test J: The Stoplamps Are On Continuously**

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

**Normal Operation**

When the brake pedal is applied, the stoplamp switch closes and voltage is routed to the high mounted stoplamp and the multifunction switch. The multifunction switch then routes the voltage to the LH and RH stoplamps.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Stoplamp switch
- Multifunction switch

**PINPOINT TEST J: THE STOPLAMPS ARE ON CONTINUOUSLY**





**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>J1 CHECK THE STOPLAMP SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Stoplamp Switch C278.</li> <li>• <b>Do the stoplamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>J2</u> .</p> <p><b>No</b> INSTALL a new stoplamp switch. REFER to <u>Stoplamp Switch</u> in this section. TEST the system for normal operation.</p>
<b>J2 CHECK THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Multifunction Switch C202c and C202a.</li> <li>• <b>Do the stoplamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> If the LH rear stoplamp continues to illuminate, REPAIR circuit 9 (LG/OG) or circuit 5 (OG/LB) as necessary. TEST the system for normal operation.</p>

	<p>If the RH rear stoplamp continues to illuminate, REPAIR circuit 5 (OG/LB). TEST the system for normal operation.</p> <p>If the high mounted stoplamp continues to illuminate, REPAIR circuit 10 (LG/RD). TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p>
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**Turn Signal, Cornering and Hazard Lamps****Special Tool(s)**

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST3104-A	Backprobe Kit POM6411 or equivalent

**Principles of Operation****Turn Signals**

When the multifunction switch is placed in the LH or RH TURN position, voltage is routed to the turn lamps. If the Lighting Control Module (LCM) does not detect a bulb outage, the LCM flashes the turn lamps at approximately 80 times per minute. If a bulb outage is detected (higher resistance), the LCM flashes the remaining turn lamps approximately 160 times per minute.

**Cornering Lamps**

The cornering lamps are supplied voltage from the parking lamp circuit. The multifunction switch provides a ground path for the respective cornering lamp when the turn signal is in the LH or RH TURN position. When the turn signal is activated and the parking lamps are on, the cornering lamp illuminates on the turn side and remains illuminated until the turn signal cancels.

**Hazard Lamps**

When the hazard switch is engaged, the LCM flashes all the turn lamps at approximately 80 times per minute.

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Multifunction switch</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 10 (15A) (hazard lamps) (except police)</li> <li>◆ 10 (20A) (hazard lamps) (police)</li> <li>◆ 11 (15A) (turn signal lamps)</li> </ul> </li> <li>• Wiring, terminals or connectors</li> <li>• Bulbs</li> <li>• Lighting Control Module (LCM)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .

9. If the DTCs retrieved are related to the concern, refer to Diagnostic Trouble Code (DTC) Chart in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

**Symptom Chart**

Symptom Chart

**Pinpoint Tests****Pinpoint Test K: The Turn Signal Lamps Are Inoperative**

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

**Normal Operation**

The Central Junction Box (CJB) provides voltage to the multifunction switch which is then routed to the LCM . The LCM provides voltage back to the multifunction switch. When the multifunction switch is placed in the LH or RH TURN position, voltage is routed to the LH or RH turn lamps.

- DTC B1873 (Turn Signal/Hazard Power Feed Short to Ground) - an on-demand DTC that sets when the LCM detects a short to ground from the turn/hazard power supply circuit.

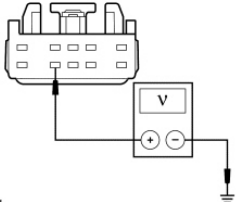
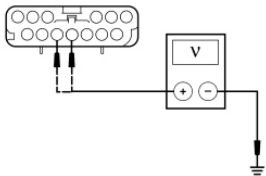
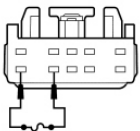
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Multifunction switch
- LCM

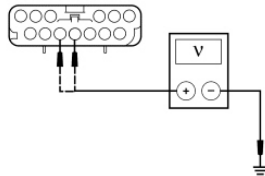
**PINPOINT TEST K: THE TURN SIGNAL LAMPS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>K1 CHECK THE STOPLAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Apply and release the brake pedal.</li> <li>• <b>Do the stoplamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>K2</u> .</p> <p><b>No</b> REFER to <u>Stoplamps</u> in this section.</p>
<b>K2 CHECK THE OPERATION OF THE TURN LAMPS</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Place the multifunction switch in the LH and RH TURN positions while observing the turn lamps.</li> <li>• <b>Do the turn lamps illuminate and not flash?</b></li> </ul>	<p><b>Yes</b> GO to <u>K9</u> .</p> <p><b>No</b> GO to <u>K3</u> .</p>
<b>K3 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202a .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the multifunction switch C202a-9, circuit 1039 (BK/YE), harness side and ground.</li> </ul>  <p>A0048294</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> GO to <u>K4</u> .</p> <p><b>No</b> VERIFY the CJB fuse 11 (15A) is OK. If OK, REPAIR circuit 1039 (BK/YE) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<p><b>K4 CHECK FOR VOLTAGE TO THE LCM</b></p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Multifunction Switch C202a .</li> <li>• Disconnect: LCM C2145d .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the LCM C2145d-11, circuit 385 (WH/RD), harness side and ground; and between the LCM C2145d-12, circuit 385 (WH/RD), harness side and ground.</li> </ul>  <p>N0043380</p> <p>• Are the voltages greater than 10 volts?</p>	<p><b>Yes</b> GO to <u>K6</u> .</p> <p><b>No</b> If the voltage is not greater than 10 volts at one of the pins, REPAIR circuit 385 (WH/RD) for an open. TEST the system for normal operation.</p> <p>If the voltage is not greater than 10 volts at both pins, GO to <u>K5</u> .</p>
<p><b>K5 BYPASS THE MULTIFUNCTION SWITCH</b></p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202a .</li> <li>• Connect a fused jumper wire between the multifunction switch C202a-9, circuit 1039 (BK/YE), harness side and the multifunction switch C202a-10, circuit 385 (WH/RD), harness side.</li> </ul>  <p>N0043381</p>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 385 (WH/RD) for an open. TEST the system for normal operation.</p>

- Ignition ON.
- Measure the voltage between the LCM C2145d-11, circuit 385 (WH/RD), harness side and ground; or between the LCM C2145d-12, circuit 385 (WH/RD), harness side and ground.

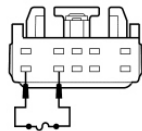


N0043380

- Is the voltage greater than 10 volts?

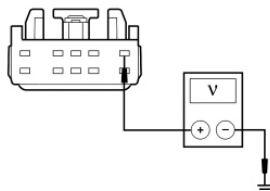
### K6 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH

- Ignition OFF.
- Connect: LCM C2145d .
- Disconnect: Multifunction Switch C202a .
- Connect a fused jumper wire between the multifunction switch C202a-9, circuit 1039 (BK/YE), harness side and the multifunction switch C202a-10, circuit 385 (WH/RD), harness side.



N0043381

- Ignition ON.
- Measure the voltage between the multifunction switch C202a-1, circuit 44 (LB), harness side and ground.



N0043382

- Is the voltage greater than 10 volts?

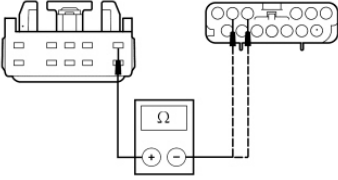
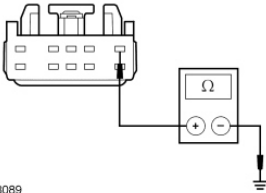
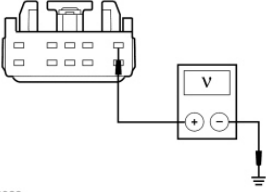
#### Yes

REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to [Section 211-05](#) . TEST the system for normal operation.

#### No

REMOVE the jumper wire. GO to [K7](#) .

### K7 CHECK THE LCM OUTPUT CIRCUIT FOR AN OPEN

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145d .</li> <li>• Measure the resistance between the multifunction switch C202a-1, circuit 44 (LB), harness side and the LCM C2145d-24, circuit 44 (LB), harness side; and between the multifunction switch C202a-1, circuit 44 (LB), harness side and the LCM C2145d-25, circuit 44 (LB), harness side.</li> </ul>  <p>N0060052</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K8</u> .</p> <p><b>No</b> REPAIR circuit 44 (LB) for an open. TEST the system for normal operation.</p>
<p><b>K8 CHECK THE LCM OUTPUT CIRCUIT FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the multifunction switch C202a-1, circuit 44 (LB), harness side and ground.</li> </ul>  <p>N0088089</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K10</u> .</p> <p><b>No</b> REPAIR circuit 44 (LB) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<p><b>K9 CHECK THE LCM OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202a .</li> <li>• Disconnect: LCM C2145d .</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the multifunction switch C202a-1, circuit 44 (LB), harness side and ground.</li> </ul>  <p>N0043382</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR circuit 44 (LB) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>K10</u> .</p>
<p><b>K10 CHECK FOR CORRECT LCM OPERATION</b></p>	



<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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**Pinpoint Test L: One Turn Signal Lamp Is Inoperative/Always On**

Refer to Wiring Diagrams Cell 90 , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

**Normal Operation**

When the multifunction switch is placed in the LH or RH TURN position, voltage is routed to the LH or RH front turn signal.

The rear turn lamps utilize the circuitry for the stoplamps.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Multifunction switch

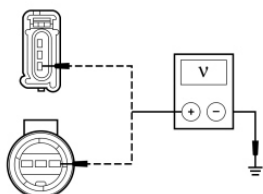
**PINPOINT TEST L: ONE TURN SIGNAL/HAZARD LAMP IS INOPERATIVE/ALWAYS ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>L1 CHECK THE STOPLAMPS</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Apply and release the brake pedal.</li> <li>• <b>Do the stoplamps operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>L2</u> .</p> <p><b>No</b> REFER to <u>Stoplamps</u> in this section.</p>
<b>L2 DETERMINE IF A TURN LAMP IS ALWAYS ON OR INOPERATIVE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>Is a front turn lamp always illuminated?</b></li> </ul>	<p><b>Yes</b> GO to <u>L5</u> .</p> <p><b>No</b> GO to <u>L3</u> .</p>
<b>L3 CHECK FOR VOLTAGE TO THE INOPERATIVE TURN LAMP</b>	

- Ignition OFF.
- Disconnect: Inoperative Turn Lamp .
- Measure the voltage between the inoperative lamp, harness side and ground as follows:

Inoperative Lamp	Connector-Pin	Circuit
LH front (Crown Victoria)	C1023-3	3 (LG/WH)
RH front (Crown Victoria)	C1043-3	2 (WH/LB)
LH front (Grand Marquis)	C1115-3	3 (LG/WH)
RH front (Grand Marquis)	C1116-3	2 (WH/LB)



N0107591

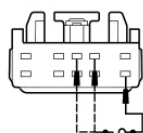
- Is the voltage alternate between 0 and greater than 10 volts?

**Yes**  
REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.

**No**  
GO to L4 .

#### L4 CHECK THE TURN LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN

- Connect: Inoperative Turn Lamp .
- Disconnect: Multifunction Switch C202a .
- Connect a fused jumper wire between the multifunction switch C202a-6, circuit 383 (RD/WH), harness side and the multifunction switch C202a-2 (LH front turn lamp), circuit 3 (LG/WH), harness side; or between the multifunction switch C202a-6, circuit 383 (RD/WH), harness side and the multifunction switch C202a-3 (RH front turn lamp), circuit 2 (WH/LB), harness side.



N0056273

- Does the turn lamp illuminate?

**Yes**  
REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to Section 211-05 . TEST the system for normal operation.

**No**  
REMOVE the jumper wire. REPAIR circuit 3 (LG/WH) (LH front turn lamp) or circuit 2 (WH/LB) (RH front turn lamp) for an open. TEST the system for normal operation.

#### L5 CHECK THE TURN LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect: Multifunction Switch C202a .
- Ignition ON.
- Does the turn lamp continue to illuminate?

**Yes**  
REPAIR circuit 3 (LG/WH) (LH front turn lamp) or circuit 2 (WH/LB) (RH front

	turn lamp) for a short to voltage. TEST the system for normal operation.  <b>No</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.
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### Pinpoint Test M: The Cornering Lamp Is Inoperative

Refer to Wiring Diagrams Cell 91 , Cornering Lamps for schematic and connector information.

#### Normal Operation

The cornering lamps are provided voltage when the parking lamps are on. The ground path is routed to the multifunction switch. When the multifunction switch is placed in the LH or RH TURN position, the multifunction switch completes the path to ground.

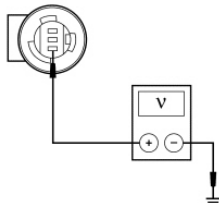
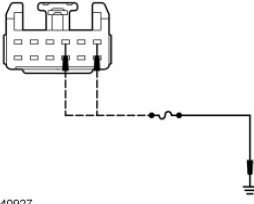
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Multifunction switch

#### PINPOINT TEST M: THE CORNERING LAMP IS INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>M1 CHECK THE FLASH-TO-PASS OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• Place the multifunction switch in the HIGH BEAM position.</li> <li>• <b>Does the high beam indicator illuminate?</b></li> </ul>	<p><b>Yes</b>            If both cornering lamps are inoperative, INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p> <p>If one cornering lamp is inoperative, GO to <u>M2</u> .</p> <p><b>No</b>            REFER to <u>Headlamps</u> in this section.</p>
<b>M2 CHECK FOR VOLTAGE TO THE INOPERATIVE CORNERING LAMP</b>	

<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Cornering Lamp .</li> <li>• Place the headlamp switch in the PARKING LAMPS ON position.</li> <li>• Measure the voltage between the LH cornering lamp C151-1, circuit 14 (BN), harness side and ground; or between the RH cornering lamp C161-1, circuit 14 (BN), harness side and ground.</li> </ul>  <p>N0088090</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>M3</u> .</p> <p><b>No</b> REPAIR circuit 14 (BN) for an open. TEST the system for normal operation.</p>
<b>M3 BYPASS THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Connect: Inoperative Cornering Lamp .</li> <li>• Disconnect: Multifunction Switch C202c .</li> <li>• Connect a fused jumper wire between the multifunction switch C202c-1 (LH cornering lamp), circuit 380 (VT/YE), harness side and ground; or between the multifunction switch C202c-3 (RH cornering lamp), circuit 379 (BN/WH), harness side and ground.</li> </ul>  <p>N0040927</p> <ul style="list-style-type: none"> <li>• Place the headlamp switch in the PARKING LAMPS ON position.</li> <li>• Is the cornering lamp illuminated?</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 380 (VT/YE) (LH cornering lamp) or circuit 379 (BN/WH) (RH cornering lamp). TEST the system for normal operation.</p>

**Pinpoint Test N: The Cornering Lamp Is Always On**

Refer to Wiring Diagrams Cell 91 , Cornering Lamps for schematic and connector information.

**Normal Operation**

The cornering lamps are provided voltage when the parking lamps are on. The ground path is routed to the multifunction switch. When the multifunction switch is placed in the LH or RH TURN position, the multifunction switch completes the path to ground.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Multifunction switch

**PINPOINT TEST N: THE CORNERING LAMP IS ALWAYS ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>N1 CHECK THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Multifunction Switch C202c .</li> <li>• Place the headlamp switch in the PARKING LAMPS ON position.</li> <li>• <b>Does the cornering lamp continue to illuminate?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 380 (VT/YE) (LH cornering lamp) or circuit 379 (BN/WH) (RH cornering lamp) for a short to ground. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new multifunction switch. REFER to <a href="#">Section 211-05</a> . TEST the system for normal operation.</p>

**Pinpoint Test O: The Hazard Lamps Are Inoperative**

Refer to Wiring Diagrams Cell [90](#) , Turn Signal/Stop/Hazard Lamps for schematic and connector information.

**Normal Operation**

The Central Junction Box (CJB) provides voltage to the multifunction switch when the hazard switch is engaged. Voltage is then routed to the Lighting Control Module (LCM). The LCM provides voltage back to the multifunction switch. Voltage is then routed to all the turn lamps.

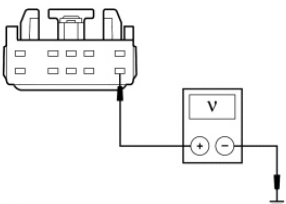
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Multifunction switch

**PINPOINT TEST O: THE HAZARD LAMPS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>O1 CHECK THE PARKING LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> </ul>	<p><b>Yes</b> GO to <a href="#">Q2</a> .</p>

<ul style="list-style-type: none"> <li>Place the headlamp switch in the PARKING LAMPS ON position.</li> <li><b>Do the parking lamps operate correctly?</b></li> </ul>	<p><b>No</b> REFER to <u>Parking, Rear and License Plate Lamps</u> in this section.</p>
<b>O2 CHECK THE TURN SIGNAL OPERATION</b>	
<ul style="list-style-type: none"> <li>Place the headlamp switch in the OFF position.</li> <li>Ignition ON.</li> <li>Place the multifunction switch in the LH and RH TURN positions.</li> <li><b>Do the turn signals operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <u>Q3</u> .</p> <p><b>No</b> GO to <u>Pinpoint Test K</u> .</p>
<b>O3 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Multifunction Switch C202a .</li> <li>Measure the voltage between the multifunction switch C202a-6, circuit 383 (RD/WH), harness side and ground.</li> </ul>  <p>A0048302</p> <ul style="list-style-type: none"> <li><b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> INSTALL a new multifunction switch. REFER to <u>Section 211-05</u> . TEST the system for normal operation.</p> <p><b>No</b> VERIFY the CJB fuse 10 (15A non-police vehicles) (20A police vehicles) is OK. If OK, REPAIR circuit 383 (RD/WH) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>

### Pinpoint Test AF: The Turn Signal Lamps Flash Fast And All Bulbs Operate

#### Normal Operation

When the multifunction switch is placed in the LH or RH turn position and all 3 bulbs are OK, the Lighting Control Module (LCM) flashes the turn lamps approximately 80 times per minute. The electronics within the LCM can determine when a bulb is inoperative based on the total resistance (or load) of 3 bulbs specified for the vehicle. When one of the 3 bulbs becomes inoperative, the resistance increases and the load decreases. If high resistance is present within turn the signal circuitry, such as corrosion at a ground contact point or a loosely connected pin within a connector, the LCM may interpret this as a bulb out and flash the turn signals fast even though all the bulbs illuminate.

For vehicles with the police option, the rear stop/turn lamp circuits also provide voltage to the coil side of a corresponding emergency flasher relay for the package tray lamps. These relays have no affect on the turn signal operation provided by the LCM .

#### Possible Causes

- Bulb(s)
- High circuit resistance
- Multifunction switch

- LCM

**PINPOINT TEST AF: THE TURN SIGNAL LAMPS FLASH FAST AND ALL BULBS OPERATE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** It is necessary to create a 6-inch jumper wire to carry out the voltage drop testing. Use only 18 gauge wire with one end of the jumper wire having approximately one-half inch of insulation stripped off and the other end having a terminal to accommodate the digital multimeter. The bare wire fits between the bulb and the terminal of the lamp socket.

Test Step	Result / Action to Take								
<b>AF1 CHECK THE BULBS</b>									
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Inspect the bulbs and make sure they are the correct type.</li> </ul> <table border="1"> <thead> <tr> <th>Bulb Location</th><th>Bulb Type</th></tr> </thead> <tbody> <tr> <td>Front Park/Turn Bulb (Crown Victoria)</td><td>3457 AK amber</td></tr> <tr> <td>Front Park/Turn Bulb (Grand Marquis)</td><td>3157 AK amber</td></tr> <tr> <td>Rear Stop/Turn Bulbs</td><td>3157 K</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>• Are the correct bulbs installed?</li> </ul>	Bulb Location	Bulb Type	Front Park/Turn Bulb (Crown Victoria)	3457 AK amber	Front Park/Turn Bulb (Grand Marquis)	3157 AK amber	Rear Stop/Turn Bulbs	3157 K	<p><b>Yes</b> If both sides flash fast, GO to <a href="#">AF2</a> . If one side flashes fast, GO to <a href="#">AF4</a> .</p> <p><b>No</b> INSTALL the correct bulbs. TEST the system for normal operation.</p>
Bulb Location	Bulb Type								
Front Park/Turn Bulb (Crown Victoria)	3457 AK amber								
Front Park/Turn Bulb (Grand Marquis)	3157 AK amber								
Rear Stop/Turn Bulbs	3157 K								
<b>AF2 CHECK THE MULTIFUNCTION SWITCH PIN CONNECTION</b>									
<ul style="list-style-type: none"> <li>• Disconnect: Multifunction Switch C202a .</li> <li>• Inspect the multifunction switch C202a-1, circuit 44 (LB) to make sure the terminal is secure in the connector and that the terminal is not spread open to cause a loose connection with the multifunction switch.</li> <li>• Is the multifunction switch connection OK?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AF3</a> .</p> <p><b>No</b> REPAIR the connection to C202a of the multifunction switch. TEST the system for normal operation.</p>								
<b>AF3 CHECK THE CONNECTION AT G410</b>									
<p><b>NOTE:</b> A wire routed directly from the battery ground cable to G410 can be used to bypass the body connection to determine if high resistance is present between the G410 connection and ground.</p> <ul style="list-style-type: none"> <li>• Inspect the ground connection G410 and make sure the wires to the eyelet are secure and the connection to the body is clean and free of corrosion.</li> <li>• Is the connection to the body clean, secure and free of corrosion?</li> </ul>	<p><b>Yes</b> INSTALL a new multifunction switch. REFER to <a href="#">Section 211-05</a> . TEST the system for normal operation. If the concern is still present, GO to <a href="#">AF9</a> .</p> <p><b>No</b> REPAIR the G410 connection as necessary. TEST the system for normal operation.</p>								
<b>AF4 CHECK THE BULB CONNECTIONS</b>									

<p><b>NOTE:</b> If water intrusion is present within the lamp assembly, the lamp assembly should be repaired or replaced to prevent future electrical concerns.</p> <ul style="list-style-type: none"><li>• Disconnect: Suspect Turn Lamps .</li><li>• Inspect all the bulb holders on the suspect side and make sure the terminals are secure in the connector, free of corrosion and that the terminals are not spread open to cause a loose connection with the bulb.</li><li>• <b>Is the connection of the bulb clean, secure and free of corrosion?</b></li></ul>	<p><b>Yes</b> GO to <u>AF5</u> .</p> <p><b>No</b> REPAIR the bulb connection as necessary. TEST the system for normal operation.</p>																		
<p><b>AF5 CHECK THE CONNECTIONS AT G102 (LH FRONT), G109 (RH FRONT) AND G410 (REAR)</b></p>																			
<p><b>NOTE:</b> A wire routed directly from the battery ground cable to the ground eyelet can be used to bypass the body connection to determine if high resistance is present between the eyelet connection and ground.</p> <ul style="list-style-type: none"><li>• Inspect the ground connections at G102 (LH front), G109 (RH front) and G410 (rear) and make sure the wires to the eyelets are secure and the connections to the body are clean and free of corrosion.</li><li>• <b>Are the connections to the body clean, secure and free of corrosion?</b></li></ul>	<p><b>Yes</b> GO to <u>AF6</u> .</p> <p><b>No</b> REPAIR the G410 connection as necessary. TEST the system for normal operation.</p>																		
<p><b>AF6 CHECK THE PIN CONNECTIONS AT THE MULTIFUNCTION SWITCH CONNECTORS</b></p>																			
<ul style="list-style-type: none"><li>• Disconnect: Multifunction Switch C202a and C202c .</li><li>• Inspect the multifunction switch connector to make sure the terminals are secure in the connector and that the terminals are not spread open to cause a loose connection with the multifunction switch. Refer to the following table for the pin connections.</li></ul> <table><tr><td></td><td><b>Connector-Pin (Front Lamp)</b></td><td><b>Connector-Pin (Rear Lamps)</b></td></tr><tr><td><b>Suspect Turn Signals</b></td><td><b>Circuit</b></td><td><b>Circuit</b></td></tr><tr><td>LH</td><td>C202a-2</td><td>C202c-2</td></tr><tr><td></td><td>3 (LG/WH)</td><td>9 (LG/OG)</td></tr><tr><td>RH</td><td>C202a-3</td><td>C202a-5</td></tr><tr><td></td><td>2 (WH/LB)</td><td>5 (OG/LB)</td></tr></table> <ul style="list-style-type: none"><li>• <b>Is the multifunction switch connection OK?</b></li></ul>		<b>Connector-Pin (Front Lamp)</b>	<b>Connector-Pin (Rear Lamps)</b>	<b>Suspect Turn Signals</b>	<b>Circuit</b>	<b>Circuit</b>	LH	C202a-2	C202c-2		3 (LG/WH)	9 (LG/OG)	RH	C202a-3	C202a-5		2 (WH/LB)	5 (OG/LB)	<p><b>Yes</b> GO to <u>AF7</u> .</p> <p><b>No</b> REPAIR the connection to C202a or C202c as necessary to the multifunction switch. TEST the system for normal operation.</p>
	<b>Connector-Pin (Front Lamp)</b>	<b>Connector-Pin (Rear Lamps)</b>																	
<b>Suspect Turn Signals</b>	<b>Circuit</b>	<b>Circuit</b>																	
LH	C202a-2	C202c-2																	
	3 (LG/WH)	9 (LG/OG)																	
RH	C202a-3	C202a-5																	
	2 (WH/LB)	5 (OG/LB)																	
<p><b>AF7 CARRY OUT A VOLTAGE DROP TEST ON THE BULB GROUND CIRCUITS</b></p>																			



**NOTE:** Make sure to measure at all the lamps on the side of the concern.

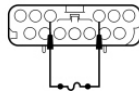
**NOTE:** Make sure that there is some voltage drop when carrying out this step. There should always be some voltage drop. A voltage reading of 0 volts indicates that the test is being incorrectly carried out.

- Connect: Multifunction Switch C202a and C202c .
- Disconnect: LCM C2145d .
- **NOTE:** The bulb is shown removed for clarity. The bulb must be installed for correct test results.
- Connect a wire between the bulb and the ground terminal of the turn lamp.



N0112980

- Connect a fused jumper wire between the LCM C2145d-23, circuit 195 (TN/WH), harness side and the LCM C2145d-24, circuit 44 (LB), harness side



N0112981

- Place the multifunction switch in the LH or RH TURN position (the side that flashes fast).
- **NOTE:** The bulb is shown removed for clarity. The bulb must be installed for correct test results.
- Carry out a voltage drop test on the circuits between the suspect turn lamps and ground as follows:

Suspect Turn Lamp	Connector-Pin	Circuit
LH front (Crown Victoria)	C1023-1	57 (BK)
LH front (Grand Marquis)	C1115-1	57 (BK)
LH rear	C4112-1	57 (BK)
LH rear	C4113-1	57 (BK)
RH front (Crown Victoria)	C1043-1	57 (BK)
RH front (Grand Marquis)	C1116-1	57 (BK)

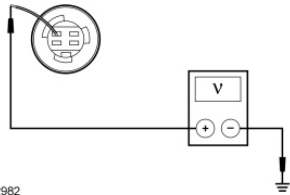
**Yes**

REMOVE the jumper wires. GO to **AF8** .

**No**

REMOVE the jumper wires. REPAIR the ground circuit in question for high resistance. TEST the system for normal operation.

RH rear	C4114-1	57 (BK)
RH rear	C4115-1	57 (BK)



N0112982

- Is the voltage drop less than .2 volts?

### AF8 CARRY OUT A VOLTAGE DROP TEST ON THE BULB POWER CIRCUITS

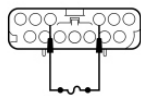
**NOTE:** Make sure to measure at all the lamps on the side of the concern.

- **NOTE:** The bulb is shown removed for clarity. The bulb must be installed for correct test results.
- Connect a wire between the bulb and the turn signal power terminal of the turn lamp.



N0112983

- Connect a fused jumper wire between the LCM C2145d-23, circuit 195 (TN/WH), harness side and the LCM C2145d-24, circuit 44 (LB), harness side



N0112981

- Place the multifunction switch in the LH or RH TURN position (the side that flashes fast).
- **NOTE:** The bulb is shown removed for clarity. The bulb must be installed for correct test results.
- Carry out a voltage drop test on the circuits between the suspect turn lamps and the backside of the multifunction switch connector as follows:

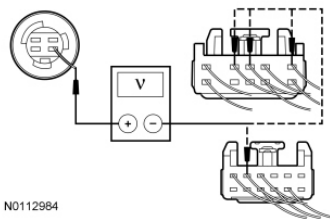
#### Yes

REMOVE the jumper wires. INSTALL a new multifunction switch. REFER to [Section 211-05](#) . TEST the system for normal operation.

#### No

REMOVE the jumper wires. REPAIR the power circuit in question for high resistance. TEST the system for normal operation.

Suspect Turn Lamp Connector-Pin	Multifunction Switch Connector-Pin	Circuit
LH front C1023-3 (Crown Victoria)	C202a-2	3 (LG/WH)
LH front C1115-3 (Grand Marquis)	C202a-2	3 (LG/WH)
LH rear C4112-3	C202c-2	9 (LG/OG)
LH rear C4113-3	C202c-2	9 (LG/OG)
RH front C1043-3 (Crown Victoria)	C202a-3	2 (WH/LB)
RH front C1116-3 (Grand Marquis)	C202a-3	2 (WH/LB)
RH rear C4114-3	C202a-5	5 (OG/LB)
RH rear C4115-3	C202a-5	5 (OG/LB)



- Is the voltage drop less than .2 volts?

#### AF9 CHECK FOR CORRECT LCM OPERATION

- Disconnect all the LCM connectors.
- Check for:
  - ◆ corrosion
  - ◆ pushed-out pins
- Connect all the LCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- Is the concern still present?




**Yes**  
INSTALL a new LCM . REFER to Section 419-10 . TEST the system for normal operation.

**No**  
The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.



**Parking, Rear and License Plate Lamps**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The Lighting Control Module (LCM) supplies voltage to the parking lamps dependent on inputs received from the headlamp switch.

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Headlamp switch</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse 25 (15A)</li> <li>• Wiring, terminals or connectors</li> <li>• Bulb(s)</li> <li>• Lighting Control Module (LCM)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .

9. If the DTCs retrieved are related to the concern, refer to Diagnostic Trouble Code (DTC) Chart in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test P: One Or More Parking, Rear Or License Plate Lamps Are Inoperative

Refer to Wiring Diagrams Cell 92 , Parking, Rear and License Lamps for schematic and connector information.

#### Normal Operation

The Central Junction Box (CJB) supplies voltage to the Lighting Control Module (LCM). When a request for the parking lamps is detected, the LCM provides voltage to the parking and license plate lamps.

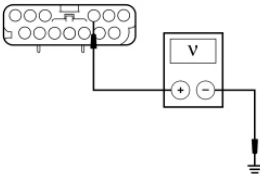
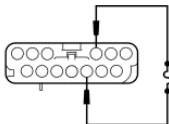
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors

- LCM

**PINPOINT TEST P: ONE OR MORE PARKING, REAR OR LICENSE PLATE LAMPS ARE INOPERATIVE**

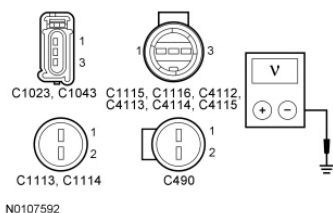
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>P1 DETERMINE IF ALL THE PARKING LAMPS ARE INOPERATIVE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Place the headlamp switch in the PARKING LAMPS ON position.</li> <li>• <b>Are all of the parking and license lamps inoperative?</b></li> </ul>	<p><b>Yes</b> GO to <u>P2</u> .</p> <p><b>No</b> GO to <u>P4</u> .</p>
<b>P2 CHECK FOR VOLTAGE TO THE LCM</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Disconnect: LCM C2145d.</li> <li>• Measure the voltage between the LCM C2145d-23, circuit 195 (TN/WH), harness side and ground.</li> </ul>  <p>N0043385</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>P3</u> .</p> <p><b>No</b> VERIFY the CJB fuse 25 (15A) is OK. If OK, REPAIR circuit 195 (TN/WH) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>P3 BYPASS THE LCM</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the LCM C2145d-23, circuit 195 (TN/WH), harness side and the LCM C2145d-10, circuit 14 (BN), harness side.</li> </ul>  <p>N0043386</p> <ul style="list-style-type: none"> <li>• <b>Do the parking lamps illuminate?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>P5</u> .</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 14 (BN) for an open. TEST the system for normal operation.</p>

**P4 CHECK FOR VOLTAGE TO THE PARKING LAMP**

- Place the headlamp switch in the OFF position.
- Disconnect: Inoperative Parking or License Plate Lamp.
- Place the headlamp switch in the PARKING LAMPS ON position.
- Measure the voltage between the inoperative lamp, harness side and ground as follows:

Inoperative Lamp	Connector-Pin	Circuit
LH front parking (Crown Victoria)	C1023-2	14 (BN)
RH front parking (Crown Victoria)	C1043-2	14 (BN)
LH front parking (Grand Marquis)	C1115-2	14 (BN)
RH front parking (Grand Marquis)	C1116-2	14 (BN)
LH front side marker (Crown Victoria)	C1113-1	14 (BN)
RH front side marker (Crown Victoria)	C1114-1	14 (BN)
License plate	C490-2	14 (BN)
LH rear	C4112-2	14 (BN)
LH rear	C4113-2	14 (BN)
RH rear	C4114-2	14 (BN)
RH rear	C4115-2	14 (BN)



- Is the voltage greater than 10 volts?

**Yes**

REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.

**No**

REPAIR circuit 14 (BN) for an open. TEST the system for normal operation.

**P5 CHECK FOR CORRECT LCM OPERATION**

- Disconnect all the LCM connectors.

**Yes**

INSTALL a new LCM . REFER to [Section](#)



<ul style="list-style-type: none"> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><u>419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
--	--

### Pinpoint Test Q: The Parking, Rear And License Plate Lamps Are On Continuously

Refer to Wiring Diagrams Cell 92 , Parking, Rear and License Lamps for schematic and connector information.

#### Normal Operation

The Central Junction Box (CJB) supplies voltage to the Lighting Control Module (LCM). When a request for the parking lamps is detected, the LCM provides voltage to the parking and license plate lamps.

- DTC B1578 (Lamp Park Input Short to Ground) - an on-demand DTC that sets when the LCM detects a short to ground from the parking lamps on input circuit.

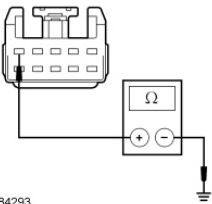
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Headlamp switch
- LCM

### PINPOINT TEST Q: THE PARKING, REAR AND LICENSE PLATE LAMPS ARE ON CONTINUOUSLY

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.




Test Step	Result / Action to Take
<b>Q1 CHECK THE RECORDED DTCs FROM THE LCM SELF-TEST</b>	
<ul style="list-style-type: none"> <li>• Use the recorded results from the LCM self-test.</li> <li>• <b>Is DTC B1578 present?</b></li> </ul>	<p><b>Yes</b> GO to <u>Q2</u> .</p> <p><b>No</b> GO to <u>Q4</u> .</p>
<b>Q2 CHECK THE HEADLAMP SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Headlamp Switch C205a.</li> <li>• Carry out the headlamp switch component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p>	<p><b>Yes</b> GO to <u>Q3</u> .</p> <p><b>No</b> INSTALL a new headlamp switch. REFER to <u>Headlamp Switch</u> in this section. CLEAR the DTCs. REPEAT the self-test.</p>

<ul style="list-style-type: none"> <li>• Is the headlamp switch OK?</li> </ul>	
<b>Q3 CHECK THE PARKING LAMPS REQUEST INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145a.</li> <li>• Measure the resistance between the headlamp switch C205a-5, circuit 1032 (WH/BK), harness side and ground.</li> </ul>  <p>N0084293</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>Q5</u> .</p> <p><b>No</b> REPAIR circuit 1032 (WH/BK) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<b>Q4 CHECK THE LCM OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145d.</li> <li>• Ignition ON.</li> <li>• Do the exterior lamps continue to illuminate?</li> </ul>	<p><b>Yes</b> REPAIR circuit 14 (BN) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>Q5</u> .</p>
<b>Q5 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>



**Fog Lamps**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

When the fog lamp switch is engaged (with the exterior lamps on and the high beams not illuminated), the Lighting Control Module (LCM) energizes the fog lamp relay and power is supplied to the fog lamps.

**Inspection and Verification**

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

<b>Mechanical</b>	<b>Electrical</b>
<ul style="list-style-type: none"> <li>• Headlamp switch</li> </ul>	<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 15 (15A)</li> <li>• Wiring, terminals or connectors</li> <li>• Fog lamp relay</li> <li>• Fog lamp</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
  - Check the scan tool connection to the VCM .
  - Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.
6. If the scan tool does not communicate with the vehicle:
- Verify the ignition key is in the ON position.
  - Verify the scan tool operation with a known good vehicle.
  - Refer to Section 418-00 to diagnose no response from the PCM.
7. Carry out the network test.
- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
  - If the network test passes, retrieve and record the continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .
9. If the DTCs retrieved are related to the concern, refer to Diagnostic Trouble Code (DTC) Chart in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test R: Both Fog Lamps Are Inoperative

Refer to Wiring Diagrams Cell 86 , Fog Lamps for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) sends a voltage reference signal to the headlamp switch. When the fog lamp switch is engaged, the signal is routed to ground. When a request for the fog lamps is detected (and the exterior lamps are on), the LCM provides voltage to the fog lamp relay coil, energizing the fog lamp relay. Voltage for the fog lamp relay is provided by the Battery Junction Box (BJB). When the fog lamp relay is energized, voltage is routed to the fog lamps.

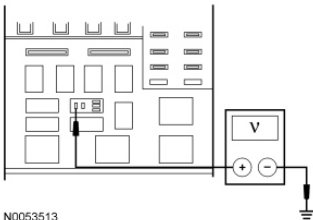
#### **This pinpoint test is intended to diagnose the following:**

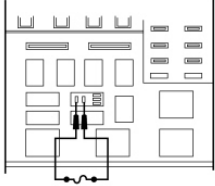
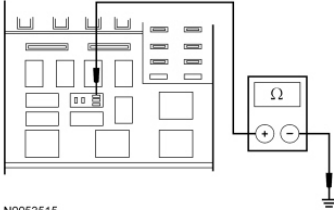
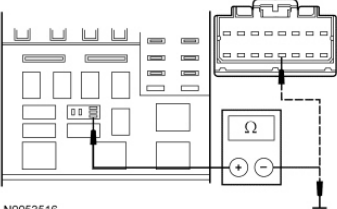
- Fuse
- Wiring, terminals or connectors
- Fog lamp relay
- Headlamp switch
- LCM

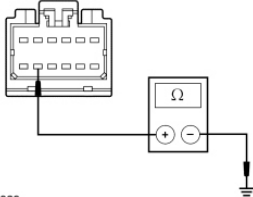
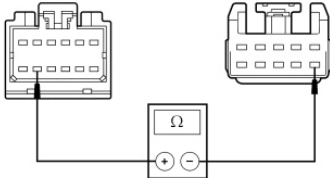
**PINPOINT TEST R: BOTH FOG LAMPS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
<b>R1 MONITOR THE LCM HEADLAMP SWITCH PID</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM headlamp switch status PID (HD_LMP_SW) while placing the headlamp switch in the PARKING LAMPS ON position and engaging the fog lamp switch.</li> <li>• <b>Does the headlamp switch PID indicate the fog lamp switch is active?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">R2</a> .</p> <p><b>No</b> GO to <a href="#">R7</a> .</p>
<b>R2 CHECK THE FOG LAMP RELAY</b>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: Fog Lamp Relay.</li> <li>• Carry out the fog lamp relay component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <a href="#">149</a> for component testing.</p> <p>• <b>Is the fog lamp relay OK?</b></p>	<p><b>Yes</b> GO to <a href="#">R3</a> .</p> <p><b>No</b> INSTALL a new fog lamp relay. TEST the system for normal operation.</p>
<b>R3 CHECK FOR VOLTAGE TO THE FOG LAMP RELAY</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the voltage between the fog lamp relay pin 3, circuit 1669 (OG/LG), harness side and ground.</li> </ul>  <p>N0053513</p> <p>• <b>Is the voltage greater than 10 volts?</b></p>	<p><b>Yes</b> GO to <a href="#">R4</a> .</p> <p><b>No</b> VERIFY the BJB fuse 15 (15A) is OK. If OK, REPAIR circuit 1669 (OG/LG) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>R4 BYPASS THE FOG LAMP RELAY</b>	

<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the fog lamp relay pin 3, circuit 1669 (OG/LG), BJB face side and the fog lamp relay pin 5, circuit 478 (TN/OG), BJB face side.</li> </ul>  <p>N0053514</p> <ul style="list-style-type: none"> <li>• Do the fog lamps illuminate?</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>R5</u> .</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 478 (TN/OG) for an open. TEST the system for normal operation.</p>
<b>R5 CHECK THE FOG LAMP RELAY GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the fog lamp relay pin 2, circuit 57 (BK), BJB face side and ground.</li> </ul>  <p>N0053515</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>R6</u> .</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<b>R6 CHECK THE FOG LAMP RELAY COIL CIRCUIT FOR AN OPEN AND SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145b.</li> <li>• Measure the resistance between the fog lamp relay pin 1, circuit 1347 (DB/WH), BJB face side and the LCM C2145a-12, circuit 1347 (DB/WH), harness side; and between the fog lamp relay pin 1, circuit 1347 (DB/WH), BJB face side and ground.</li> </ul>  <p>N0053516</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms between the fog lamp relay and the LCM , and greater than 10,000 ohms between the fog lamp relay and ground?</li> </ul>	<p><b>Yes</b> GO to <u>R9</u> .</p> <p><b>No</b> REPAIR circuit 1347 (DB/WH) as necessary. TEST the system for normal operation.</p>
<b>R7 CHECK THE HEADLAMP SWITCH INPUT</b>	

<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Disconnect: LCM C2145b.</li> <li>• Place the headlamp switch in the PARKING LAMPS ON position and engage the fog lamp switch.</li> <li>• Measure the resistance between the LCM C2145b-11, circuit 477 (LB/BK), harness side and ground.</li> </ul>  <p>N0043389</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>R9</u> .</p> <p><b>No</b> GO to <u>R8</u> .</p>
<b>R8 CHECK THE FOG LAMP REQUEST INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Headlamp Switch C205a.</li> <li>• Measure the resistance between the LCM C2145b-11, circuit 477 (LB/BK), harness side and the headlamp switch C205a-6, circuit 477 (LB/BK), harness side.</li> </ul>  <p>N0043390</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new headlamp switch. REFER to <u>Headlamp Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 477 (LB/BK) for an open. TEST the system for normal operation.</p>
<b>R9 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test S: An Individual Fog Lamp Is Inoperative

Refer to Wiring Diagrams Cell 86 , Fog Lamps for schematic and connector information.



**Normal Operation**

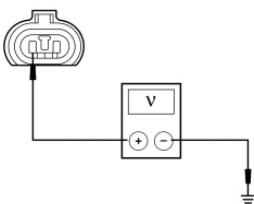
When the fog lamp relay is energized, voltage is routed to the fog lamps. Each fog lamp has a dedicated ground circuit.

**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Fog lamp relay
- Headlamp switch
- LCM

**PINPOINT TEST S: AN INDIVIDUAL FOG LAMP IS INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>S1 CHECK FOR VOLTAGE TO THE FOG LAMP</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Turn the headlamps on and engage the fog lamp switch.</li> <li>• measure the voltage between the LH fog lamp C152-2, circuit 478 (TN/OG), harness side and ground; or between the RH fog lamp C162-2, circuit 478 (TN/OG), harness side and ground.</li> </ul>  <p>N0085771</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 478 (TN/OG) for an open. TEST the system for normal operation.</p>

**Pinpoint Test T: The Fog Lamps Are On Continuously**

Refer to Wiring Diagrams Cell 86 , Fog Lamps for schematic and connector information.

**Normal Operation**

The Lighting Control Module (LCM) sends a voltage reference signal to the headlamp switch. When the fog lamp switch is engaged, the signal is routed to ground. When a request for the fog lamps is detected (and the exterior lamps are on), the LCM provides voltage to the fog lamp relay coil, energizing the fog lamp relay. When the fog lamp relay is energized, voltage is routed to the fog lamps.

**This pinpoint test is intended to diagnose the following:**

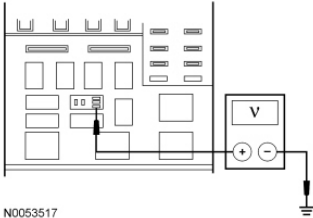
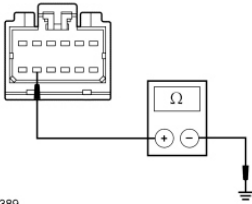
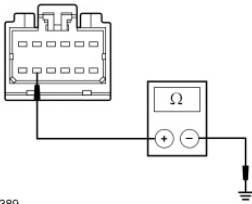
- Wiring, terminals or connectors
- Fog lamp relay
- Headlamp switch

- LCM

**PINPOINT TEST T: THE FOG LAMPS ARE ON CONTINUOUSLY**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.



Test Step	Result / Action to Take
<b>T1 MONITOR THE LCM HEADLAMP SWITCH PID</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• <b>NOTE:</b> Make sure the headlamp switch is in the OFF position.</li> <li>• Monitor the LCM headlamp switch status PID (HD_LMP_SW).</li> <li>• <b>Does the headlamp switch PID indicate the fog lamp switch is active?</b></li> </ul>	<p><b>Yes</b> GO to <u>T5</u> .</p> <p><b>No</b> GO to <u>T2</u> .</p>
<b>T2 CHECK THE FOG LAMP RELAY OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Fog Lamp Relay.</li> <li>• Ignition ON.</li> <li>• <b>Do the fog lamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 478 (TN/OG) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>T3</u> .</p>
<b>T3 CHECK THE FOG LAMP RELAY</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Carry out the fog lamp relay component test.</li> </ul> <p>Refer to Wiring Diagrams Cell <u>149</u> for component testing.</p> <ul style="list-style-type: none"> <li>• <b>Is the fog lamp relay OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>T4</u> .</p> <p><b>No</b> INSTALL a new fog lamp relay. TEST the system for normal operation.</p>
<b>T4 CHECK THE FOG LAMP RELAY COIL CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the fog lamp relay pin 1, circuit 1347 (DB/WH), BJB face side and ground.</li> </ul>	<p><b>Yes</b> REPAIR circuit 1347 (DB/WH) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>T7</u> .</p>

 <p>N0053517</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<b>T5 CHECK THE INPUT TO THE LCM</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the LCM C2145b-11, circuit 477 (LB/BK), harness side and ground.</li> </ul>  <p>N0043389</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>T7</u> .</p> <p><b>No</b> GO to <u>T6</u> .</p>
<b>T6 CHECK THE FOG LAMP REQUEST INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145b.</li> <li>• Disconnect: Headlamp Switch C205a.</li> <li>• Measure the resistance between the LCM C2145b-11, circuit 477 (LB/BK), harness side and ground.</li> </ul>  <p>N0043389</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new headlamp switch. REFER to <u>Headlamp Switch</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 477 (LB/BK) for a short to ground. TEST the system for normal operation.</p>
<b>T7 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Operate the system and verify the concern is still present.</li><li>• <b>Is the concern still present?</b></li></ul> |  |
|--|--|
-

**Reversing Lamps**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation****Reversing Lamps**

**NOTE:** The reversing lamps are not powered by the Lighting Control Module (LCM).

The reversing lamp system consists of the following:

- Reversing lamps
- Digital Transmission Range (TR) sensor

With the transmission in REVERSE (R), the digital TR sensor contacts close and voltage is provided to the reversing lamps.

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B** . Failure to follow these instructions may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection Chart**

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Digital Transmission Range (TR) sensor</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse 20 (10A)</li> <li>• Wiring, terminals or connectors</li> <li>• Bulb(s)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom. GO to Symptom Chart .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test U: Both Reversing Lamps Are Inoperative

Refer to Wiring Diagrams Cell 93 , Reversing Lamps for schematic and connector information.

#### Normal Operation


When the ignition switch is in the RUN position, voltage is provided to the digital Transmission Range (TR) sensor from the Central Junction Box (CJB). When the transmission is placed in REVERSE (R), the digital TR sensor routes voltage to the reversing lamps. The reversing lamps share a ground with the license plate lamps.

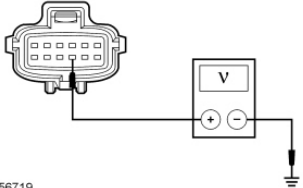
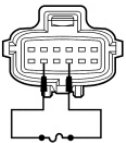
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Digital TR sensor

#### PINPOINT TEST U: BOTH REVERSING LAMPS ARE INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>U1 CHECK THE REVERSING LAMPS GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Place the headlamp switch in the PARKING LAMPS ON position and observe the license plate lamps.</li> <li>• <b>Do the license plate lamps illuminate?</b></li> </ul>	<p><b>Yes</b> GO to <u>U2</u> .</p> <p><b>No</b> REPAIR circuit 57 for an open. TEST the system for normal operation.</p>
<b>U2 CHECK THE DIGITAL TR SENSOR ADJUSTMENT</b>	
<p> <b>WARNING:</b> If the vehicle is equipped with a fire suppression system, repower the</p>	<p><b>Yes</b> GO to <u>U3</u> .</p>

<p><b>system. For important safety warnings and procedures, refer to <u>Section 100-02B</u> . Failure to follow these instructions may result in serious personal injury.</b></p> <ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• If equipped with a fire suppression system, depower the system. Refer to <u>Section 100-02B</u> .</li> <li>• Check the digital TR sensor adjustment. Refer to <u>Section 307-01</u> .</li> <li>• <b>Is the digital TR sensor adjusted correctly?</b></li> </ul>	<p><b>No</b> ADJUST the digital TR sensor. REFER to <u>Section 307-01</u> . TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the system. REFER to <u>Section 100-02B</u> .</p>
<p><b>U3 CHECK FOR VOLTAGE TO THE DIGITAL TR SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Digital TR Sensor C167.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the digital TR sensor C167-9, circuit 1789 (VT/WH), harness side and ground.</li> </ul>  <p><small>A0056719</small></p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>U4</u> .</p> <p><b>No</b> VERIFY the CJB fuse 20 (10A) is OK. If OK, REPAIR circuit 1789 (VT/WH) for an open. TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the system. REFER to <u>Section 100-02B</u> . If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<p><b>U4 BYPASS THE DIGITAL TR SENSOR</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect a fused jumper wire between the digital TR sensor C167-9, circuit 1789 (VT/WH), harness side and the digital TR sensor C167-11, circuit 140 (BK/PK), harness side.</li> </ul>  <p><small>A0056720</small></p> <ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• <b>Do the reversing lamps illuminate?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new digital TR sensor. REFER to <u>Section 307-01</u> . TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the system. REFER to <u>Section 100-02B</u> .</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 140 (BK/PK) for an open. TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the system. REFER to <u>Section 100-02B</u> .</p>

### Pinpoint Test V: An Individual Reversing Lamp Is Inoperative

#### PINPOINT TEST U: BOTH REVERSING LAMPS ARE INOPERATIVE

Refer to Wiring Diagrams Cell 93 , Reversing Lamps for schematic and connector information.

### Normal Operation

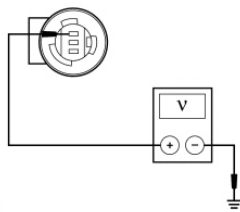
When the transmission is placed in REVERSE (R), the digital Transmission Range (TR) sensor routes voltage to the reversing lamps.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors

### PINPOINT TEST V: AN INDIVIDUAL REVERSING LAMP IS INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>V1 CHECK FOR VOLTAGE TO THE REVERSING LAMP</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Inoperative Reversing Lamp.</li> <li>• Apply the parking brake.</li> <li>• Select REVERSE.</li> <li>• Measure the voltage between the LH reversing lamp C451-3, circuit 140 (BK/PK), harness side and ground; or between the RH reversing lamp C461-3, circuit 140 (BK/PK), harness side and ground.</li> </ul>  <p>N0088091</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 140 (BK/PK) for an open. TEST the system for normal operation.</p>

### Pinpoint Test W: The Reversing Lamps Are On Continuously

Refer to Wiring Diagrams Cell 93 , Reversing Lamps for schematic and connector information.

### Normal Operation

When the ignition switch is in the RUN position, voltage is provided to the digital Transmission Range (TR) sensor from the Central Junction Box (CJB). When the transmission is placed in REVERSE (R), the digital TR sensor routes voltage to the reversing lamps.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors



- Auto-dimming interior mirror
- Digital TR sensor

**PINPOINT TEST W: THE REVERSING LAMPS ARE ON CONTINUOUSLY**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to [Section 100-02B](#) . Failure to follow these instructions may result in serious personal injury.



**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>W1 CHECK THE DIGITAL TR SENSOR</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• If equipped with a fire suppression system, depower the fire suppression system. Refer to <a href="#">Section 100-02B</a> .</li> <li>• Disconnect: Digital TR Sensor C167.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Ignition ON.</li> <li>• <b>Do the reversing lamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> If equipped with an auto-dimming interior mirror, GO to <a href="#">W2</a> .</p> <p>If not equipped with an auto-dimming interior mirror, REPAIR circuit 140 (BK/PK) for a short to voltage. TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the fire suppression system. REFER to <a href="#">Section 100-02B</a> .</p> <p><b>No</b> INSTALL a new digital TR sensor. REFER to <a href="#">Section 307-01</a> . TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the fire suppression system. REFER to <a href="#">Section 100-02B</a> .</p>
<b>W2 CHECK THE DIGITAL TR SENSOR OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Auto-Dimming Interior Mirror C911.</li> <li>• Ignition ON.</li> <li>• <b>Do the reversing lamps continue to illuminate?</b></li> </ul>	<p><b>Yes</b> REPAIR circuit 140 (BK/PK) for a short to voltage. TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the fire suppression system. REFER to <a href="#">Section 100-02B</a> .</p> <p><b>No</b> INSTALL a new auto-dimming interior mirror. REFER to <a href="#">Section 501-09</a> . TEST the system for normal operation. If equipped with a fire suppression system, REPOWER the fire suppression system. REFER to <a href="#">Section 100-02B</a> .</p>



**Public Safety - Police Package**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Inspection and Verification**

**⚠ WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **Section 100-02B**. Failure to follow these instructions may result in serious personal injury.

1. Verify the concern.
2. Visually inspect for obvious signs of electrical damage.

**Visual Inspection Chart**

Electrical
<ul style="list-style-type: none"> <li>• Spotlamps</li> <li>• Package tray lamps (non-fleet vehicles)</li> <li>• Rear flasher lamps (non-fleet vehicles)</li> <li>• Emergency flasher relay block (non-fleet vehicles)</li> <li>• Police power relay (located in the Battery Junction Box (BJB))</li> <li>• Wig-wag module (located on the RH side inner fender) (fleet vehicles)</li> <li>• Strobe lamp control module (located in the luggage compartment on the LH side of the communication service tray) (fleet vehicles)</li> <li>• Strobe lamps (located in the grille, front and rear lamp assemblies) (fleet vehicles)</li> <li>• Rear deck LED flasher (located on either side of the high mounted stoplamp) (fleet vehicles)</li> <li>• Switch control panel (located on the console mounting platform) (fleet vehicles)</li> <li>• Police glove compartment/relay fuse center (located in the glove compartment) (fleet vehicles)</li> <li>• Police luggage compartment relay/fuse center (located in the luggage compartment on the rear LH side of the communication service tray) (fleet vehicles)</li> <li>• Police light bar relay/fuse center (located in the luggage compartment on the rear LH side of the communication service tray) (fleet vehicles)</li> <li>• BJB fuse(s):               <ul style="list-style-type: none"> <li>◆ 2 (20A) (spotlamps)</li> <li>◆ 12 (25A) (package tray lamps)</li> <li>◆ 111 (50A) (low band radio) (fleet vehicles)</li> </ul> </li> </ul>

- ◆ 112 (40A) (police power relay)
- ◆ 113 (50A) (RH lower A-pillar connector and light bar relay/fuse center) (fleet vehicles)
- ◆ 114 (50A) (police accessory trunk connector and light bar relay/fuse center) (fleet vehicles)
- ◆ 115 (50A) (police accessory trunk connector and light bar relay/fuse center) (fleet vehicles)
- ◆ 118 (50A) (police trunk relay/fuse center)
- Central Junction Box (CJB) fuse 9 (7.5A) (police power relay coil)
- In-line fuse (10A) (police power relay supply) (fleet vehicles)
- Wiring, terminals or connectors

**NOTE:** The fuses in the following table are used for systems that are determined by the end user.

### Visual Inspection Chart

Electrical
<ul style="list-style-type: none"> <li>• Police glove compartment/relay fuses</li> <li>• Police luggage compartment relays and fuses</li> <li>• Police light bar relays and fuses</li> <li>• BJB fuse(s):                             <ul style="list-style-type: none"> <li>◆ 22 (20A)</li> <li>◆ 23 (20A) (fleet vehicles)</li> <li>◆ 108 (20A) (fleet vehicles)</li> <li>◆ 111 (50A) (non-fleet vehicles)</li> <li>◆ 113 (50A) (non-fleet vehicles)</li> <li>◆ 114 (50A) (non-fleet vehicles)</li> <li>◆ 115 (50A) (police rear auxiliary junction box and C-pillar connector) (non-fleet vehicles)</li> <li>◆ 116 (50A) (non-fleet vehicles)</li> <li>◆ 117 (50A) (non-fleet vehicles)</li> <li>◆ 118 (50A) (police rear Auxiliary Junction Box (AJB) and C-pillar connector) (non-fleet vehicles)</li> </ul> </li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. Verify the headlamps, stoplamps, turn signals and hazard warning flasher lamps are operating correctly. Refer to the appropriate diagnostic procedures in this section, if necessary.
5. **NOTE:** Aftermarket vehicle accessories are not covered in this section. Only factory installed police package lighting components are covered.

If the concern is not visually evident, verify the symptom. GO to Symptom Chart .

### Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test X: The Spotlamp Is Inoperative/Always On

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The spotlamp is supplied voltage from the Battery Junction Box (BJB). Ground is supplied internally by the spotlamp.

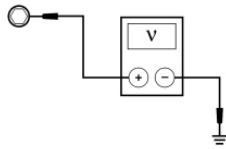
This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Spotlamp

#### PINPOINT TEST X: THE SPOTLAMP IS INOPERATIVE/ALWAYS ON

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>X1 DETERMINE IF THE SPOTLAMP IS ALWAYS ON</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Observe the spotlamp while turning the switch to the ON and OFF positions.</li> <li>• <b>Is the spotlamp always illuminated?</b></li> </ul>	<p><b>Yes</b> INSTALL a new spotlamp. REFER to <u>Spotlamp</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>X2</u> .</p>
<b>X2 CHECK FOR VOLTAGE TO THE SPOTLAMP</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Inoperative Spotlamp.</li> <li>• Measure the voltage between the LH spotlamp C2205-1, circuit 931 (OG), harness side and ground; or between the RH spotlamp C2206-1, circuit 931 (OG), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new spotlamp. REFER to <u>Spotlamp</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> VERIFY the BJB fuse 2 (20A) is OK. If OK, REPAIR circuit 631 (OG) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>



A0085429

- Is the voltage greater than 10 volts?

### Pinpoint Test Y: The Package Tray Lamps Do Not Operate Correctly

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The emergency flasher relays (switch side) are supplied voltage from the Battery Junction Box (BJB). Voltage is provided to the LH and RH emergency flasher relay coils from the vehicle rear stop/turn lamp circuits. When the relay is energized, voltage is routed to the LH and RH package tray lamps.

This pinpoint test is intended to diagnose the following:

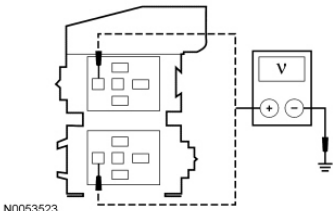
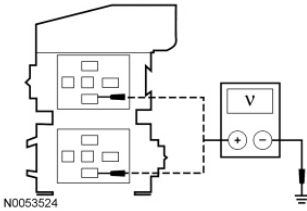
- Fuse
- Wiring, terminals or connectors
- Package tray lamp
- Emergency flasher relay

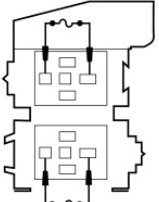
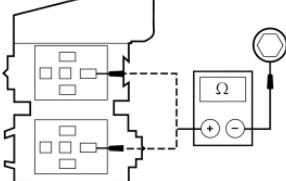
#### PINPOINT TEST Y: THE PACKAGE TRAY LAMPS DO NOT OPERATE CORRECTLY

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Make sure the base vehicle lighting systems operate correctly before carrying out any test steps.

Test Step	Result / Action to Take
<b>Y1 DETERMINE IF A PACKAGE TRAY LAMP IS ALWAYS ON</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Is a package tray lamp illuminated?</li> </ul>	<p><b>Yes</b> GO to <u>Y7</u> .</p> <p><b>No</b> GO to <u>Y2</u> .</p>
<b>Y2 CHECK THE RELAY</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Suspect Emergency Flasher Relay.</li> <li>• Substitute a known good emergency flasher relay and recheck the system operation.</li> <li>• Does the package tray lamp illuminate?</li> </ul>	<p><b>Yes</b> REMOVE the known good relay. INSTALL a new emergency flasher relay. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the known good relay. GO to <u>Y3</u> .</p>

<b>Y3 CHECK FOR VOLTAGE TO THE SUSPECT EMERGENCY FLASHER RELAY (SWITCH SIDE)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the voltage between the emergency flasher relay 1 (LH lamp) pin 87, circuit 1271 (VT), relay box face side and ground; or between the emergency flasher relay 2 (RH lamp) pin 87, circuit 1271 (VT), relay box face side and ground.</li> </ul>  <p>N0053523</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>Y4</u> .</p> <p><b>No</b> VERIFY the BJB fuse 12 (25A) is OK. If OK, REPAIR circuit 1271 (VT) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>Y4 CHECK FOR VOLTAGE TO THE SUSPECT EMERGENCY FLASHER RELAY (COIL SIDE)</b>	
<ul style="list-style-type: none"> <li>• While applying the brake pedal, measure the voltage between the emergency flasher relay 1 (LH lamp) pin 85, circuit 9 (LG/OG), relay box face side and ground; or between the emergency flasher relay 2 (RH lamp) pin 85, circuit 5 (OG/LB), relay box face side and ground.</li> </ul>  <p>N0053524</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>Y5</u> .</p> <p><b>No</b> REPAIR circuit 9 (LG/OG) (LH relay) or circuit 5 (OG/LB) (RH relay) for an open. TEST the system for normal operation.</p>
<b>Y5 BYPASS THE RELAY</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the emergency flasher relay 1 (LH lamp) pin 87, circuit 1271 (VT), relay box face side and the emergency flasher relay 1 (LH lamp) pin 30, circuit 9 (LG/OG), relay box face side; or between the emergency flasher relay 2 (RH lamp) pin 87, circuit 1271 (VT), relay box face side and the emergency flasher relay 2 (RH lamp) pin 30, circuit 5 (OG/LB), relay box face side.</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>Y6</u> .</p>

 <p>N0053526</p> <p>• Does the package tray lamp illuminate?</p>	
<p><b>Y6 CHECK THE PACKAGE TRAY LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Inoperative Package Tray Lamp.</li> <li>• Measure the resistance between the emergency flasher relay 1 (LH lamp) pin 30, circuit 9 (LG/OG), relay box face side and the LH package tray lamp C4299-1, circuit 9 (LG/OG), harness side; or between the emergency flasher relay 2 (RH lamp) pin 30, circuit 5 (OG/LB), relay box face side and the RH package tray lamp C4298-1, circuit 5 (OG/LB), harness side.</li> </ul>  <p>N0053527</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> INSTALL a new package tray lamp. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 9 (LG/OG) (LH relay) or circuit 5 (OG/LB) (RH relay) for an open. TEST the system for normal operation.</p>
<p><b>Y7 CHECK THE PACKAGE TRAY LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Suspect Emergency Flasher Relay.</li> <li>• Ignition ON.</li> <li>• Does the package tray lamp continue to illuminate?</li> </ul>	<p><b>Yes</b> REPAIR circuit 9 (LG/OG) (LH relay) or circuit 5 (OG/LB) (RH relay) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new emergency flasher relay. TEST the system for normal operation.</p>

### Pinpoint Test Z: The Decklid Flashing Lamps Do Not Operate Correctly

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The rear flasher relay (switched side) is supplied voltage from the Battery Junction Box (BJB). Ground for the rear flasher relay coil is provided to the decklid ajar switch when the decklid is open. When the rear flasher relay is energized, voltage is routed to the rear flasher. The rear flasher in turn, alternates voltage to the LH and RH flasher lamps.



**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Rear flasher
- Rear flasher relay
- Luggage compartment lid latch

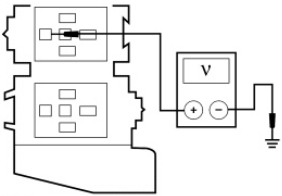
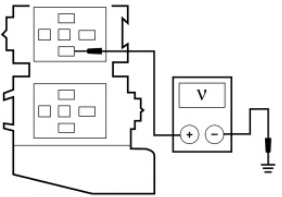
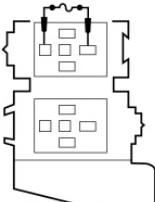
**PINPOINT TEST Z: THE DECKLID FLASHING LAMPS DO NOT OPERATE CORRECTLY**

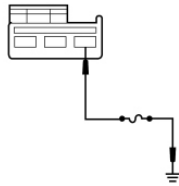
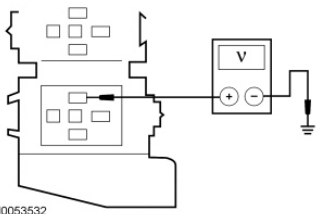

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

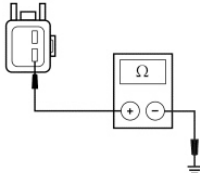
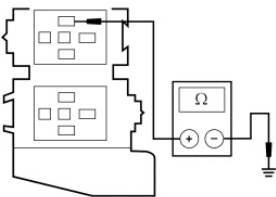
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

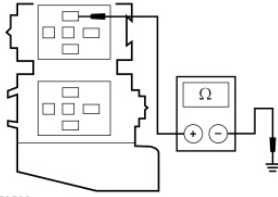
**NOTE:** Make sure the base vehicle interior lighting system and decklid release operates correctly before carrying out any test steps.

Test Step	Result / Action to Take
<b>Z1 DETERMINE IF THE FLASHER LAMPS ARE ALWAYS ON</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Open the decklid.</li> <li>• <b>Is either flasher lamp always on?</b></li> </ul>	<p><b>Yes</b> GO to <u>Z10</u> .</p> <p><b>No</b> If both lamps are inoperative, GO to <u>Z2</u> .</p> <p>If one lamp is inoperative, GO to <u>Z8</u> .</p>
<b>Z2 CHECK THE REAR FLASHER RELAY</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Rear Flasher Relay.</li> <li>• Substitute a known good rear flasher relay and recheck the system operation.</li> <li>• <b>Do the flasher lamps operate correctly?</b></li> </ul>	<p><b>Yes</b> REMOVE the known good relay. INSTALL a new rear flasher relay. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the known good relay. GO to <u>Z3</u> .</p>
<b>Z3 CHECK FOR VOLTAGE TO THE REAR FLASHER RELAY (SWITCH SIDE)</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the voltage between the rear flasher relay pin 87, circuit 1271 (VT), relay box face side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>Z4</u> .</p> <p><b>No</b> VERIFY the BJB fuse 12 (25A) is OK. If OK, REPAIR circuit 1271 (VT) for an open. TEST the system for normal operation. If not OK, REFER</p>

 <p>N0053528</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p>to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>Z4 CHECK FOR VOLTAGE TO THE REAR FLASHER RELAY (COIL SIDE)</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between the rear flasher relay pin 85, circuit 705 (LG/OG), relay box face side and ground.</li> </ul>  <p>N0053529</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>Z5</u> .</p> <p><b>No</b> REPAIR circuit 705 (LG/OG) for an open. TEST the system for normal operation.</p>
<b>Z5 BYPASS THE REAR FLASHER RELAY</b>	
<ul style="list-style-type: none"> <li>• Connect a fused jumper wire between the rear flasher relay pin 87, circuit 1271 (VT), relay box face side and the rear flasher relay pin 30, circuit 383 (RD/WH), relay box face side.</li> </ul>  <p>N0053531</p> <ul style="list-style-type: none"> <li>• Do the decklid flashing lamps operate?</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>Z6</u> .</p> <p><b>No</b> LEAVE the jumper wire connected. GO to <u>Z7</u> .</p>
<b>Z6 BYPASS THE LUGGAGE COMPARTMENT LID RELEASE SOLENOID</b>	
<ul style="list-style-type: none"> <li>• Connect: Rear Flasher Relay .</li> <li>• Disconnect: Luggage Compartment Lid Release Solenoid C430.</li> <li>• Connect a fused jumper wire between the luggage compartment lid release solenoid C430-1, circuit 486 (BN/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new luggage compartment lid latch. REFER to <u>Section 501-14</u> . TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 486 (BN/WH) for an open. TEST the system for normal operation.</p>

 <p>N0043396</p> <p>• Do the decklid flashing lamps operate?</p>	
<p><b>Z7 CHECK THE REAR FLASHER VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Rear Flasher.</li> <li>• Measure the voltage between the rear flasher pin 86, circuit 383 (RD/WH), relay box face side and ground.</li> </ul>  <p>N0053532</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new rear flasher. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 383 (RD/WH) for an open. TEST the system for normal operation.</p>
<p><b>Z8 BYPASS THE FLASHER LAMP RELAY</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Rear Flasher.</li> <li>• <b>NOTE:</b> If the fuse in the jumper wire fails, repair the circuit for a short to ground.</li> <li>• Connect a fused jumper wire between the rear flasher pin 86, circuit 383 (RD/WH), relay box face side and the rear flasher pin 85 (LH flasher lamp), circuit 1 (DB), relay box face side; or between the rear flasher pin 86, circuit 383 (RD/WH), relay box face side and the rear flasher pin 87 (RH flasher lamp), circuit 2 (WH/LB), relay box face side.</li> </ul>  <p>N0053533</p> <p>• Open the decklid.</p> <p>• Does the rear flasher lamp illuminate?</p>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new rear flasher. TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>Z9</u>.</p>
<p><b>Z9 CHECK THE FLASHER LAMP GROUND CIRCUIT FOR AN OPEN</b></p>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Disconnect: Inoperative Rear Flasher Lamp.</li> <li>• Measure the resistance between the LH flasher lamp C4163-2, circuit 57 (BK), harness side and ground; or between the RH flasher lamp C4164-2, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0043397</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1 (DB) or circuit 2 (WH/LB) as necessary for an open. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>
<p><b>Z10 CHECK THE FLASHER LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<p><b>NOTE:</b> Make sure the luggage compartment latch is latched for correct test results in Test Steps W10 through W13.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Rear Flasher.</li> <li>• Ignition ON.</li> <li>• Does a rear flasher lamp continue to illuminate?</li> </ul>	<p><b>Yes</b> REPAIR circuit 1 (DB) (LH flasher lamp) or circuit 2 (WH/LB) (RH flasher lamp) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>Z11</u> .</p>
<p><b>Z11 CHECK THE REAR FLASHER CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Rear Flasher.</li> <li>• Disconnect: Rear Flasher Relay.</li> <li>• Ignition ON.</li> <li>• Do the rear flasher lamps continue to illuminate?</li> </ul>	<p><b>Yes</b> REPAIR circuit 383 (RD/WH) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>Z12</u> .</p>
<p><b>Z12 CHECK THE REAR FLASHER RELAY</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the rear flasher relay pin 86, circuit 486 (BN/WH), relay box face side and ground.</li> </ul>  <p>N0053530</p>	<p><b>Yes</b> INSTALL a new rear flasher relay. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>Z13</u> .</p>

<ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>Z13 CHECK THE LUGGAGE COMPARTMENT LID RELEASE SOLENOID CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Luggage Compartment Lid Release Solenoid C430.</li> <li>• Measure the resistance between the rear flasher relay pin 86, circuit 486 (BN/WH), relay box face side and ground.</li> </ul>  <p>N0053530</p>	<p><b>Yes</b> INSTALL a new luggage compartment lid latch. REFER to <u>Section 501-14</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 486 (BN/WH) for a short to ground. TEST the system for normal operation.</p>
<ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	

### Pinpoint Test AA: The Alternating Flashing Headlamps Are Inoperative

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The wig-wag module provides voltage to the LH and RH high beams independently by splicing into the existing high beam circuits.

When the wig-wag module is active, a ground signal is provided to the Driver Door Module (DDM). When the DDM detects the wig-wag module is active, a message is sent over the communication network to the Lighting Control Module (LCM) to disable the manual control of the high beams.

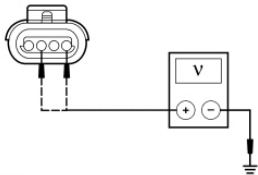
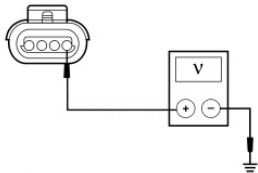
**This pinpoint test is intended to diagnose the following:**

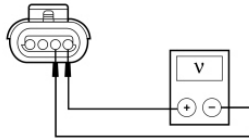
- Wiring, terminals or connectors
- Wig-wag module

#### PINPOINT TEST AA: THE ALTERNATING FLASHING HEADLAMPS ARE INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>AA1 CHECK THE ALTERNATING FLASHING HEADLAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Wig-Wag Module C1365.</li> <li>• Place the headlamp switch in the HEADLAMPS ON position.</li> <li>• Place the multifunction switch in the HIGH BEAM position.</li> <li>• Measure the voltage between the wig-wag module C1365-D (LH headlamp), circuit 1337 (VT/YE), harness side and ground; and between the wig-wag module C1365-B (RH headlamp), circuit 1335 (YE/WH), harness side and ground.</li> </ul>  <p>N0088092</p> <ul style="list-style-type: none"> <li>• Are the voltages greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AA2</a> .</p> <p><b>No</b> REPAIR circuit 1337 (VT/YE) (LH headlamp) or circuit 1335 (YE/WH) (RH headlamp) for an open. TEST the system for normal operation.</p>
<p><b>AA2 CHECK THE WIG-WAG MODULE VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Place the headlamp switch in the OFF position.</li> <li>• Ignition ON.</li> <li>• Activate the switch for the wig-wag module.</li> <li>• Measure the voltage between the wig-wag module C1365-A, circuit 7 (LG/YE), harness side and ground.</li> </ul>  <p>N0088093</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">AA3</a> .</p> <p><b>No</b> REPAIR circuit 7 (LG/YE) for an open. TEST the system for normal operation.</p>
<p><b>AA3 CHECK FOR VOLTAGE TO THE WIG-WAG MODULE USING THE CONNECTOR GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the voltage between the wig-wag module C1365-A, circuit 7 (LG/YE), harness side and the wig-wag module C1365-C, circuit 57 (BK), harness side.</li> </ul>	<p><b>Yes</b> INSTALL a new wig-wag module. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>



N0107593

- Is the voltage greater than 10 volts?

### Pinpoint Test AB: The Public Safety Equipment Power Supply Is Inoperative

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

#### Normal Operation

The police power relay (switch side) is supplied battery voltage from the Battery Junction Box (BJB) fuse 112 (40A). When the ignition switch is in the RUN position, the police power relay coil is supplied voltage from the Central Junction Box (CJB). When the police power relay is energized, voltage is routed to multiple police systems.

**This pinpoint test is intended to diagnose the following:**

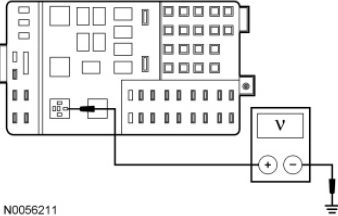
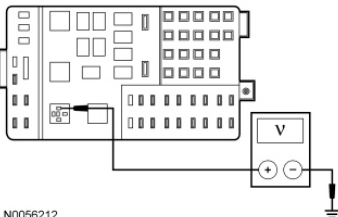
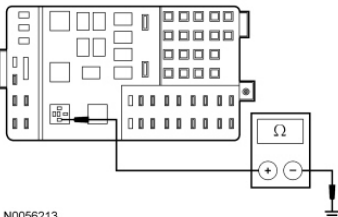
- Fuse
- Wiring, terminals or connectors
- Police power relay

#### PINPOINT TEST AB: THE PUBLIC SAFETY EQUIPMENT POWER SUPPLY IS INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>AB1 CHECK THE POLICE POWER RELAY</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Police Power Relay.</li> <li>• Substitute a know good relay and recheck the system.</li> <li>• <b>Do the police systems operate?</b></li> </ul>	<p><b>Yes</b> REMOVE the known good relay. INSTALL a new police power relay. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>AB2</u> .</p>
<b>AB2 CHECK FOR VOLTAGE TO THE POLICE POWER RELAY (SWITCH SIDE)</b>	

<ul style="list-style-type: none"> <li>• Measure the voltage between the police power relay pin 30, circuit 175 (BK/YE), BJB face side and ground.</li> </ul>  <p>N0056211</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>AB3</u> .</p> <p><b>No</b> VERIFY the BJB fuse 112 (40A) is OK. If OK, REPAIR circuit 175 (BK/YE) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<p><b>AB3 CHECK FOR VOLTAGE TO THE POLICE POWER RELAY (COIL SIDE)</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the police power relay pin 86, circuit 964 (DB/LG), BJB face side and ground.</li> </ul>  <p>N0056212</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>AB4</u> .</p> <p><b>No</b> VERIFY the CJB fuse 9 (7.5A) is OK. If OK, REPAIR circuit 964 (DB/LG) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<p><b>AB4 CHECK FOR VOLTAGE TO THE POLICE POWER RELAY USING THE RELAY GROUND PIN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the police power relay pin 85, circuit 57 (BK), BJB face side and ground.</li> </ul>  <p>N0056213</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> REPAIR circuit 401 (PK) for an open. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>

### Pinpoint Test AC: The Rear Deck LED Flasher Is Inoperative



Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

### Normal Operation

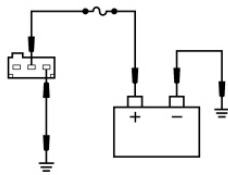
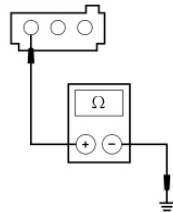
The rear deck LED flasher is provided voltage when switched on from the switch box.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Rear deck LED flasher

### PINPOINT TEST AC: THE REAR DECK LED FLASHER IS INOPERATIVE

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>AC1 CHECK THE REAR DECK LED FLASHER</b> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Rear Deck LED Flasher C4234.</li> <li>• Connect a fused jumper wire between the rear deck LED flasher C4234 pin 2, component side and battery voltage; and connect a jumper wire between the rear deck LED flasher C4234 pin 3, component side and ground.</li> </ul>  <p>A0085430</p> <ul style="list-style-type: none"> <li>• <b>Do the rear deck LED flashing lights alternate flashing on and off?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wires. GO to <u>AC2</u> .</p> <p><b>No</b> REMOVE the jumper wires. INSTALL a new rear deck LED flasher. TEST the system for normal operation.</p>
<b>AC2 CHECK THE REAR DECK LED FLASHER GROUND CIRCUIT FOR AN OPEN</b> <ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the rear deck LED flasher C4234-3, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0085431</p>	<p><b>Yes</b> REPAIR circuit 23 (TN/LG) for an open. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>

- |                                       |  |
|---------------------------------------|--|
| • Is the resistance less than 5 ohms? |  |
|---------------------------------------|--|

**Pinpoint Test AD: The Strobe Lamps Are Inoperative**

Refer to Wiring Diagrams Cell 96 , Police Option for schematic and connector information.

**Normal Operation**

The strobe control module is supplied voltage when switched on from the switch box. When the switches are actuated for the strobe lamps, voltage is routed to the strobe control module. When the strobe control module is active, high voltage is provided to the strobe lamps on individual harnesses.

**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- Strobe lamp
- Strobe control module

**PINPOINT TEST AD: THE STROBE LAMPS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

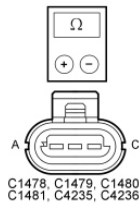
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>AD1 DETERMINE IF ALL THE STROBE LAMPS ARE INOPERATIVE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Turn the strobe lamp function on and observe the strobe lamps.</li> <li>• <b>Are all the strobe lamps inoperative?</b></li> </ul>	<p><b>Yes</b> TURN the strobe lamp function off. GO to <u>AD7</u> .</p> <p><b>No</b> TURN the strobe lamp function off. GO to <u>AD2</u> .</p>
<b>AD2 CHECK THE STROBE LAMP CIRCUITRY FOR A SHORT</b>	
<p><b>⚠ WARNING:</b> The strobe lamp power supply is a high-voltage device. Do not touch or remove the strobe lamp assembly while the unit is in operation. Wait at least 10 minutes after turning off the power before continuing diagnostics. Failure to follow these instructions may result in personal injury.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Strobe Control Module Relays (B2 and B5 in the Police Trunk Relay/Fuse Center).</li> </ul>	<p><b>Yes</b> GO to <u>AD3</u> .</p> <p><b>No</b> REPAIR the circuits in question. TEST the system for normal operation.</p>

- Disconnect: Inoperative Strobe Lamp.
- Disconnect: Corresponding Strobe Module Connector.
- Measure the resistance between the inoperative strobe lamp pins, harness side as follows:

<b>Inoperative Strobe Lamp</b>	<b>Connector-Pin/ Circuit</b>	<b>Connector-Pin/ Circuit</b>
LH front	C1478-A 361 (RD)	C1478-B 188 (WH/BK)
LH front	C1478-A 361 (RD)	C1478-C 57 (BK)
LH front	C1478-B 188 (WH/BK)	C1478-C 57 (BK)
RH front	C1479-A 361 (RD)	C1479-B 1055 (WH/LG)
RH front	C1479-A 361 (RD)	C1479-C 57 (BK)
RH front	C1479-B 1055 (WH/LG)	C1479-C 57 (BK)
LH grille	C1480-A 361 (RD)	C1480-B 385 (WH/RD)
LH grille	C1480-A 361 (RD)	C1480-C 57 (BK)
LH grille	C1480-B 385 (WH/RD)	C1480-C 57 (BK)
RH grille	C1481-A 361 (RD)	C1481-B 556 (WH)
RH grille	C1481-A 361 (RD)	C1481-C 57 (BK)
RH grille	C1481-B 556 (WH)	C1481-C 57 (BK)
LH rear	C4235-A 361 (RD)	C4235-B 556 (WH)
LH rear	C4235-A	C4235-C

	361 (RD)	57 (BK)
LH rear	C4235-B	C4235-C
	556 (WH)	57 (BK)
RH rear	C4236-A	C4236-B
	361 (RD)	556 (WH)
RH rear	C4236-A	C4236-C
	361 (RD)	57 (BK)
RH rear	C4236-B	C4236-C
	556 (WH)	57 (BK)



N0107585

- Are the resistances greater than 10,000 ohms?

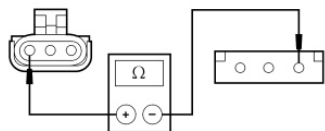
### AD3 CHECK THE INOPERATIVE STROBE LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN

- Measure the resistance between the inoperative strobe lamp, harness side and the strobe control module, harness side as follows:

Strobe Lamp Connector-Pin	Strobe Control Module Connector-Pin	Circuit
LH front C1478-A	C4231d-1	361 (RD)
RH front C1479-A	C4231e-1	361 (RD)
LH grille C1480-A	C4231g-1	361 (RD)
RH grille C1481-A	C4231f-1	361 (RD)
LH rear C4235-A	C4231h-1	361 (RD)
RH rear C4236-A	C4231j-1	361 (RD)

**Yes**  
GO to AD4 .

**No**  
REPAIR circuit 361  
(RD) for an open. TEST  
the system for normal  
operation.



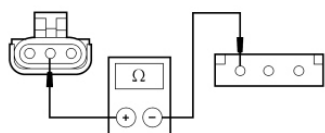
A0085439

- Is the resistance less than 1 ohm?

**AD4 CHECK THE STROBE LAMP CIRCUIT FOR AN OPEN**

- Measure the resistance between the inoperative strobe lamp, harness side and the strobe control module, harness side as follows:

Inoperative Strobe Lamp Connector-Pin	Strobe Control Module Connector-Pin	Circuit
LH front C1478-B	C4231d-3	188 (WH/BK)
RH front C1479-B	C4231e-3	1055 (WH/LG)
LH grille C1480-B	C4231g-3	385 (WH/RD)
RH grille C1481-B	C4231f-3	556 (WH)
LH rear C4235-B	C4231h-3	556 (WH)
RH rear C4236-B	C4231j-3	556 (WH)



A0085440

- Is the resistance less than 1 ohm?

**AD5 CHECK THE STROBE LAMP GROUND CIRCUIT FOR AN OPEN**

- Measure the resistance between the inoperative strobe lamp, harness side, and the strobe control module, harness side as follows:

Strobe Lamp Connector-Pin	Strobe Control Module Connector-Pin	Circuit
LH front C1478-C	C4231d-2	57 (BK)
RH front C1479-C	C4231e-2	57 (BK)
LH grille C1480-C	C4231g-2	57 (BK)

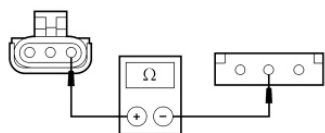
**Yes**  
GO to [AD5](#) .

**No**  
REPAIR the circuit in question. TEST the system for normal operation.

**Yes**  
GO to [AD6](#) .

**No**  
REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.

RH grille C1481-C	C4231f-2	57 (BK)
LH rear C4235-C	C4231h-2	57 (BK)
RH rear C4236-C	C4231j-2	57 (BK)



A0085441

- Is the resistance less than 1 ohm?

**AD6 CHECK THE STROBE LAMP**

**⚠ WARNING:** The strobe lamp power supply is a high-voltage device. Do not touch or remove the strobe lamp assembly while the unit is in operation. Wait at least 10 minutes after turning off the power before continuing diagnostics. Failure to follow these instructions may result in personal injury.

- Substitute a known good strobe lamp.
- Connect: Strobe Control Module.
- Connect: Strobe Control Module Relays.
- Turn the strobe lamp function on and observe the strobe lamp in question.
- Does the strobe light operate correctly?

**Yes**

REMOVE the known good strobe lamp. INSTALL a new strobe lamp. TEST the system for normal operation.

**No**

REMOVE the known good strobe lamp. INSTALL a new strobe control module. TEST the system for normal operation.

**AD7 CHECK THE VOLTAGE SUPPLY CIRCUITS FOR AN OPEN**

**⚠ WARNING:** The strobe lamp power supply is a high-voltage device. Do not touch or remove the strobe lamp assembly while the unit is in operation. Wait at least 10 minutes after turning off the power before continuing diagnostics. Failure to follow these instructions may result in personal injury.

- Ignition OFF.
- Disconnect: Strobe Control Module.
- Ignition ON.
- Activate the strobe lamp function from the strobe/light bar switches.
- Measure the voltage between the strobe control module, harness side and ground as follows:

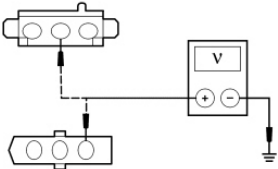
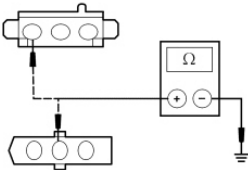
Connector-Pin	Circuit
C4231a-2	30 (BK/LG)
C4231b-2	23 (TN/LG)
C4231c-3	37 (YE)

**Yes**

GO to AD8.

**No**

REPAIR the circuit in question for an open. TEST the system for normal operation.


<div><p>N0088095</p><ul style="list-style-type: none"><li>• Are the voltages greater than 10 volts?</li></ul></div>									
<b>AD8 CHECK THE STROBE CONTROL MODULE GROUND CIRCUITS FOR AN OPEN</b>									
<div><ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Negative Battery Cable.</li><li>• Measure the resistance between the strobe control module, harness side and ground as follows:</li></ul><table><tr><th>Connector-Pin</th><th>Circuit</th></tr><tr><td>C4231a-3</td><td>57 (BK)</td></tr><tr><td>C4231b-3</td><td>57 (BK)</td></tr><tr><td>C4231c-2</td><td>57 (BK)</td></tr></table><div><p>N0088096</p><ul style="list-style-type: none"><li>• Are the resistances less than 5 ohms?</li></ul></div></div>	Connector-Pin	Circuit	C4231a-3	57 (BK)	C4231b-3	57 (BK)	C4231c-2	57 (BK)	<div><p><b>Yes</b> INSTALL a new strobe control module. TEST the system for normal operation.</p><p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p></div>
Connector-Pin	Circuit								
C4231a-3	57 (BK)								
C4231b-3	57 (BK)								
C4231c-2	57 (BK)								





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**Daytime Running Lamps (DRL)****Special Tool(s)**

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**Principles of Operation**

**NOTE:** When installing a new Lighting Control Module (LCM), it must be configured for this feature if originally equipped (standard for Canadian vehicles). Refer to [Section 418-01](#) .

The LCM controls the Daytime Running Lamps (DRL) by using various inputs to determine whether or not the DRL should be illuminated. These inputs include:

- Ignition switch position
- Headlamp switch position
- Headlamps on or off
- Transmission gear selection

The LCM can be configured to turn the DRL on for this vehicle. Refer to [Section 418-01](#) for information on this programmable parameter.

**Inspection and Verification**

1. Verify the customer concern.
2. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
3. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

4. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
  - Check the scan tool connection to the VCM .
  - Refer to [Section 418-00](#) , No Power To The Scan Tool, to diagnose no power to the scan tool.
5. If the scan tool does not communicate with the vehicle:
    - Verify the ignition key is in the ON position.
    - Verify the scan tool operation with a known good vehicle.

- Refer to Section 418-00 to diagnose no response from the PCM.
6. Carry out the network test.
    - If the scan tool responds with no communication for one or more modules, refer to Section 418-00.
    - If the network test passes, retrieve and record the continuous memory DTCs.
  7. If the DTCs retrieved are related to the concern, refer to Diagnostic Trouble Code (DTC) Chart in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10.
  8. Check the Lighting Control Module (LCM) and make sure the Daytime Running Lamps (DRL) configuration is enabled.
  9. If no DTCs related to the concern are retrieved, GO to Symptom Chart.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test AE: The Daytime Running Lamps (DRL) Are Inoperative

#### Normal Operation

When the ignition switch is in the RUN position, the headlamps are not on (from the autolamp system or manual control from the headlamp switch) and the transmission is not in PARK (P), the Lighting Control Module (LCM) provides a pulse-width modulated voltage to the low beam headlamps. This illuminates the headlamps at a reduced intensity.

**This pinpoint test is intended to diagnose the following:**

- Exterior lighting system input/output
- LCM configuration
- Ignition switch input
- Transmission gear input
- LCM

#### PINPOINT TEST AE: THE DRL ARE INOPERATIVE

Test Step	Result / Action to Take
<b>AE1 VERIFY THE DRL OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Place the gear selector lever in any gear other than PARK (P).</li> <li>• <b>Are the DRL illuminated?</b></li> </ul>	<p><b>Yes</b> The system is operating correctly. INFORM the customer of the conditions required for the DRL to operate correctly.</p>


	<b>No</b> GO to <a href="#">AE2</a> .
<b>AE2 CHECK THE OPERATION OF THE HEADLAMPS</b>	
<ul style="list-style-type: none"> <li>Place the headlamp switch in the HEADLAMPS ON position and observe the headlamps.</li> <li><b>Do the headlamps operate correctly?</b></li> </ul>	<b>Yes</b> GO to <a href="#">AE3</a> .  <b>No</b> REFER to <a href="#">Headlamps</a> in this section.
<b>AE3 CHECK THE IGNITION SWITCH INPUT</b>	
<ul style="list-style-type: none"> <li>Place the headlamp switch in the OFF position.</li> <li>Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>Monitor the LCM ignition switch PID (IGN_LCM) while cycling the ignition switch through all positions.</li> <li><b>Does the PID agree with the ignition switch positions?</b></li> </ul>	<b>Yes</b> GO to <a href="#">AE4</a> .  <b>No</b> REFER to <a href="#">Section 211-05</a> to diagnose the input from the ignition switch.
<b>AE4 CHECK THE TRANSMISSION GEAR INPUT</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: PCM DataLogger.</li> <li>Monitor the PCM transmission gear status PID (TR) while placing the gear selector lever through all positions.</li> <li><b>Does the PID agree with the gear selection?</b></li> </ul>	<b>Yes</b> GO to <a href="#">AE5</a> .  <b>No</b> REFER to <a href="#">Section 307-01</a> to diagnose the transmission range input.
<b>AE5 CHECK THE LCM FOR DRL CONFIGURATION</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: LCM Module Programming.</li> <li>Check the LCM configuration and make sure the DRL feature is enabled.</li> <li><b>Is the LCM DRL configuration enabled?</b></li> </ul>	<b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.  <b>No</b> ENABLE the DRL configuration. TEST the system for normal operation.



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## Headlamp Adjustment

### Special Tool(s)

	Vision 100 Headlamp Aimer 196-00005 or equivalent
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### Headlamp Aiming

1. The headlamp aiming procedure depends on what type of beam pattern the headlamp is equipped with. Vehicles may come equipped with VOL, VOR or SAE only (includes sealed beam type) headlamps. To identify the headlamp beam pattern, look on the headlamp lens. Molded in small letters on the headlamp lens is one of the following:
  - SAE
  - VOL and SAE
  - VOR and SAE
2. Once the headlamp beam pattern is identified, aim the headlamps using one of the following methods as applicable.
  - Photometric aimers can aim VOL-, VOR- and SAE-type headlamps only. This is the preferred method of headlamp aiming.
  - Visual or screen method aiming can be used to aim VOL-, VOR- and SAE-type headlamps only.
  - Mechanical aimers cannot be used with VOR- or VOL-type headlamps. Aerodynamic lamps that can be aimed mechanically have 3 nibs molded into the lens of the lamp.

### Photometric Aiming

1. For the photometric aiming procedure, refer to the appropriate photometric headlamp aimer instruction manual.

### Screen Method Aiming

#### All headlamp types

**NOTE:** Horizontal aim is not adjustable for VOL or VOR headlamps.

**NOTE:** Consult your state vehicle inspection manual for recommended tolerance ranges for visual aiming.

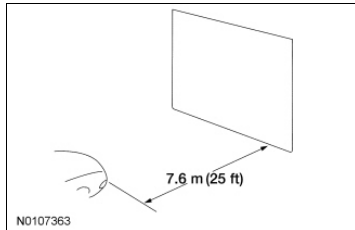
**NOTE:** The sight shield may need to be positioned or removed for access to the adjusters.

1. Before starting headlamp adjustment:
  - check the tire inflation.
  - check that no other load is in the vehicle other than a half tank of fuel.
  - check that the headlamps are clean.

- check for correct headlamp operation.
- check that the vehicle is on level ground.
- if the vehicle is equipped with air suspension, make sure that the switch is on.

2. **NOTE:** The vertical wall or screen must be a minimum of 2.4 m (8 ft) wide.

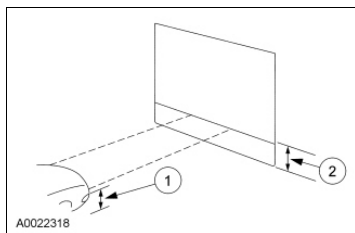
Park the vehicle on a level surface approximately 7.6 m (25 ft) from the vertical wall or screen directly in front of it.



3. **NOTE:** The center of the lamp is marked either on the lens (circle, crosshair or other mark) or on the bulb shield internal to the lamp (crosshair or other mark).

Mark a horizontal reference line on the vertical wall or screen.

1. Measure the center of the headlamp height to ground and record the measurement.
2. Make a 2.4 m (8 ft) horizontal mark (using masking tape) on the vertical wall or screen at the same distance from the ground as previously recorded.



4. **NOTE:** This procedure should be done in a dark environment to effectively see the headlamp beam pattern.

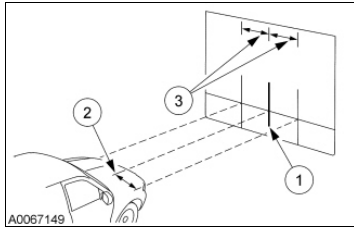
Turn on the low beam headlamps to illuminate the wall or screen and open the hood.

5. **NOTE:** For SAE-type headlamps, the appearance of the beam pattern may vary between vehicles.

On the wall or screen, locate the high intensity area of the beam pattern. Place the top edge of the high intensity zone even with the horizontal reference line.

### SAE-type headlamps

6. In addition to the horizontal line marked in Step 3, a pair of vertical lines must be marked at the center line of the headlamps on the wall or screen.
  1. Mark the center line of the vehicle on the wall or screen.
  2. Measure from the center of the headlamp to the center line of the vehicle.
  3. Make two 1.5 m (5 ft) vertical marks (using masking tape) on the wall or screen at the same distance from the vehicle center line as previously recorded.

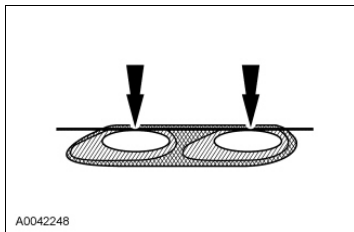


7. On the wall or screen, locate the high intensity area of the beam pattern. Place the left edge of the high intensity zone even with the vertical line corresponding to the headlamp being adjusted.

### VOR-type headlamps

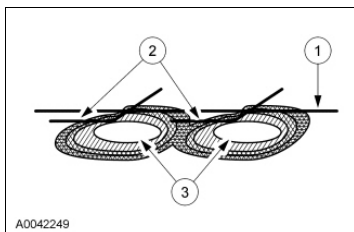
8. **NOTE:** The appearance of the VOR beam pattern may vary between vehicles.

Identify at the top edge of this high intensity area a distinct horizontal cutoff in the beam pattern. If the top edge of this cutoff is not even with the horizontal reference line, the headlamp beam needs to be adjusted.



### VOL-type headlamps

9. For VOL-type headlamps, there is a distinct cutoff in the left portion of the beam pattern. The edge of this cutoff should be positioned 50.2 mm (2 in) below the horizontal reference line.
  1. Horizontal reference line.
  2. Top edge of the beam pattern.
  3. High intensity zone.



### Mechanical Aiming

1. For the mechanical aiming procedure, refer to the appropriate mechanical headlamp aimer instruction manual.





### **Autolamps Time Delay Adjustment**

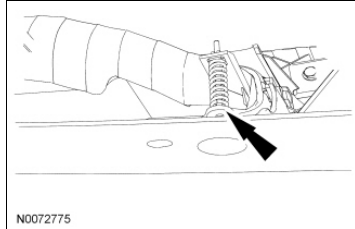
**NOTE:** The time delay can be programmed through the message center using the message center buttons (if equipped) or using the following steps.

**NOTE:** Steps 2 through 5 must be carried out within a 10-second period.

1. Start with the ignition switch off and the headlamp switch in the AUTOLAMPS ON position.
  2. Place the headlamp switch in the OFF position.
  3. Place the ignition switch in the RUN position.
  4. Place the ignition switch in the OFF position.
  5. Place the headlamp switch in the AUTOLAMPS ON position. The exterior lamps turn on at this point.
  6. Wait the desired amount of time and place the headlamp switch in the OFF position (maximum of 3 minutes). The exterior lamps turn off and the autolamp time delay is now set.
-

## Front Fog Lamp Adjustment

### Front Fog Lamp Adjustment Screw Location



**NOTE:** The adjustment screw is accessed through a hole in the bumper cover.

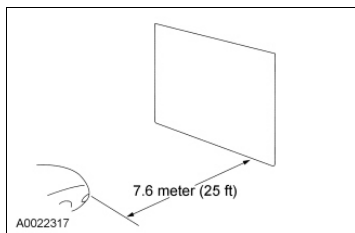
1. **NOTE:** Horizontal aim is not required for this vehicle and is not adjustable. Consult your state vehicle inspection center for recommended tolerance ranges for visual aiming.

Before starting the fog lamp assembly adjustment:

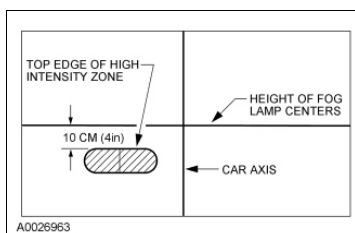
- check the tire inflation.
- make sure there are no other loads in the vehicle other than a half tank of fuel.
- make sure the vehicle is on level ground.
- make sure the fog lamps and headlamps are clean.
- make sure the headlamps are operating and are correctly aimed.

2. **NOTE:** The vertical wall screen must be a minimum of 2.4-m (8-ft) wide.

Park the vehicle on a level surface approximately 7.6 m (25 ft) from the vertical wall or screen directly in front of it.



3. The correct visual aim for the fog lamps is with the top edge of the high-intensity zone 10 cm (4 in) below the horizontal center of the fog lamps.
  - If necessary, rotate the adjustment screw until the fog lamp beam is within specification.



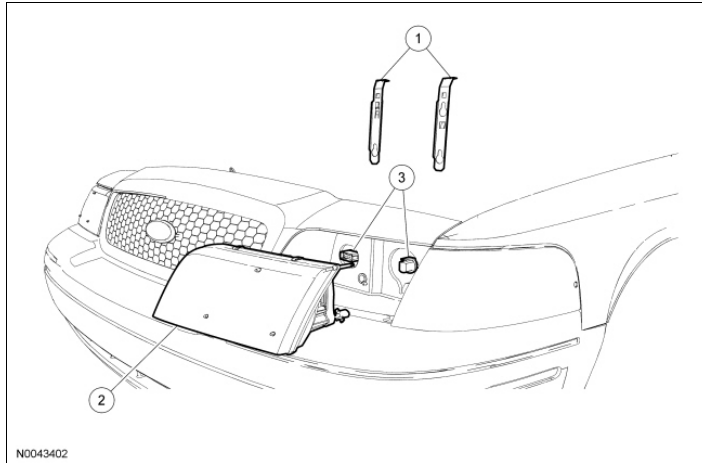


SECTION 417-01: Exterior Lighting  
REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis Workshop Manual  
Procedure revision date: 08/19/2009

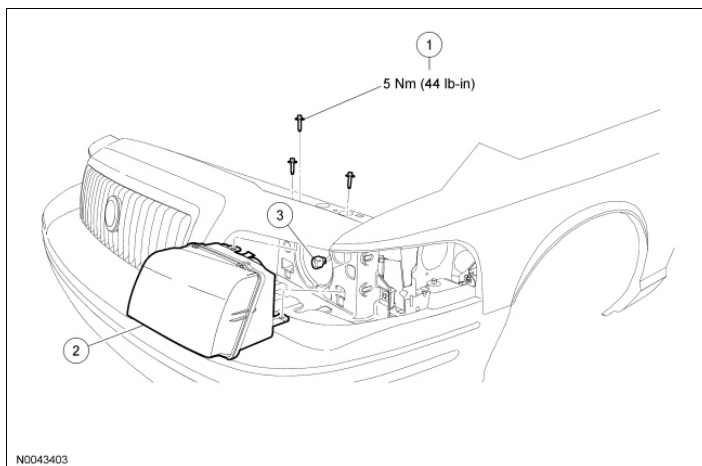
## Headlamp Assembly

### Crown Victoria



Item	Part Number	Description
1	-	Headlamp assembly retainers (2 required)
2	13006/13005	Headlamp assembly (LH/RH)
3	-	Headlamp assembly electrical connectors (part of 14290)

### Grand Marquis



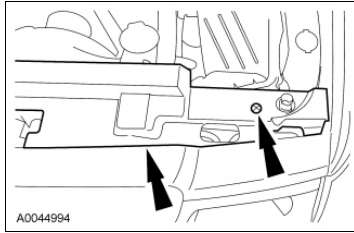
Item	Part Number	Description
1	W503925	Headlamp assembly bolts (3 required)
2	13008	Headlamp assembly
3	-	Headlamp assembly electrical connector (part of 14290)

### Removal and Installation

**NOTE:** Make sure the headlamp switch and the ignition switch are in the OFF position.

### Crown Victoria

1. Remove the 3 pin-type retainers and the radiator sight shield.



2. Remove the 2 retainers and the headlamp assembly.
  - Disconnect the electrical connectors.

### Grand Marquis

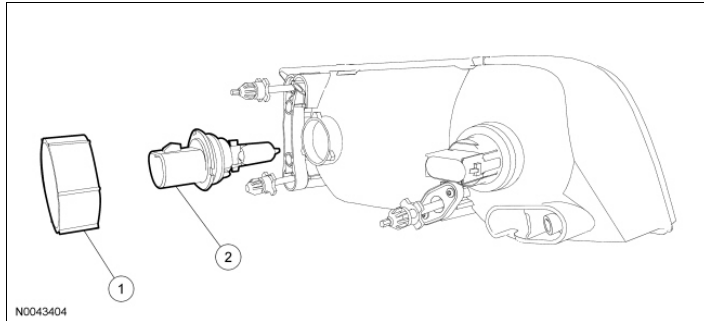
3. Remove the side turn signal lamp. For additional information, refer to Side Turn Signal Lamp in this section.
4. Remove the 3 bolts and the headlamp assembly.
  - Disconnect the electrical connector.
  - To install, tighten to 5 Nm (44 lb-in).

### All vehicles

5. To install, reverse the removal procedure.
    - If necessary, adjust the headlamps. For additional information, refer to Headlamp Adjustment in this section.
-

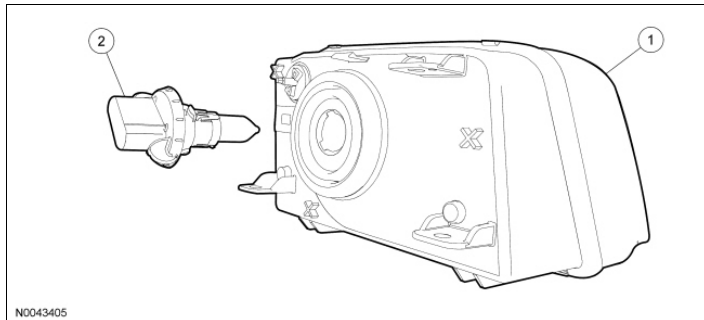
## Headlamp Bulb

### Crown Victoria



Item	Part Number	Description
1	13N019	Headlamp bulb retainer
2	13N021	Headlamp bulb

### Grand Marquis



Item	Part Number	Description
1	13008	Headlamp assembly
2	13N021	Headlamp bulb

### Removal and Installation

**⚠ WARNING:** The bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope. Failure to follow these instructions may result in personal injury.

**NOTE:** The headlamp bulb should not be removed from the headlamp until just before a new bulb is installed. Removing the bulb for an extended period of time may affect headlamp bulb performance. Contaminants may enter the headlamp where they can settle on the lens and reflector. Never turn the headlamps on with the bulb removed.

**NOTE:** Bulbs 9004 and 9007 look similar, but are not interchangeable.

### All vehicles

1. Remove the headlamp assembly. For additional information, refer to Headlamp Assembly in this section.

**Crown Victoria**

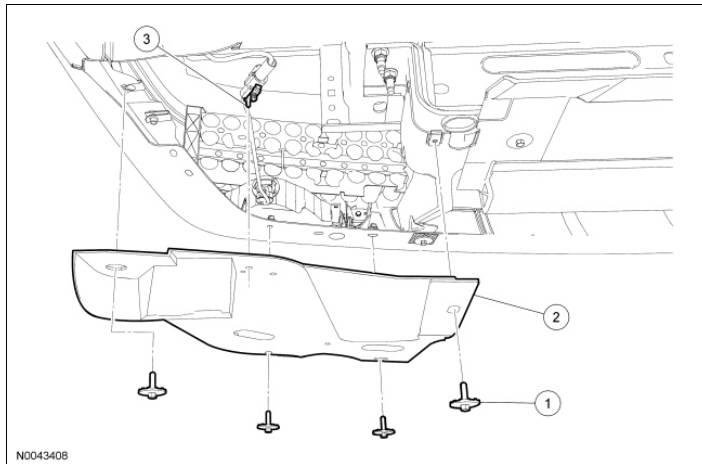
2. Rotate the headlamp bulb retainer counterclockwise and remove the retainer.
3. Grasp the headlamp bulb by its base and remove the bulb.

**Grand Marquis**

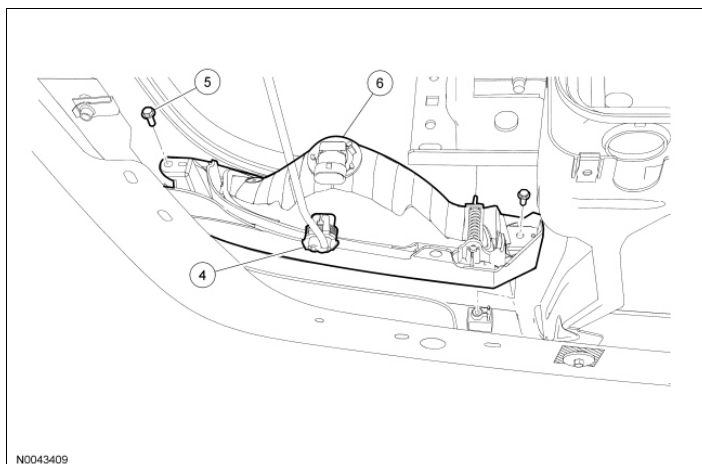
4. Rotate the headlamp bulb counterclockwise and remove the bulb.

**All vehicles**

5. To install, reverse the removal procedure.
-

**Fog Lamp**

Item	Part Number	Description
1	N808841-S	Lower radiator air deflector screws (4 required)
2	8327	Lower radiator air deflector
3	-	Electrical connector locator pin (part of 15A211)



Item	Part Number	Description
4	-	Fog lamp electrical connector (part of 15A211)
5	-	Fog lamp bolts (2 required)
6	15A200	Fog lamp

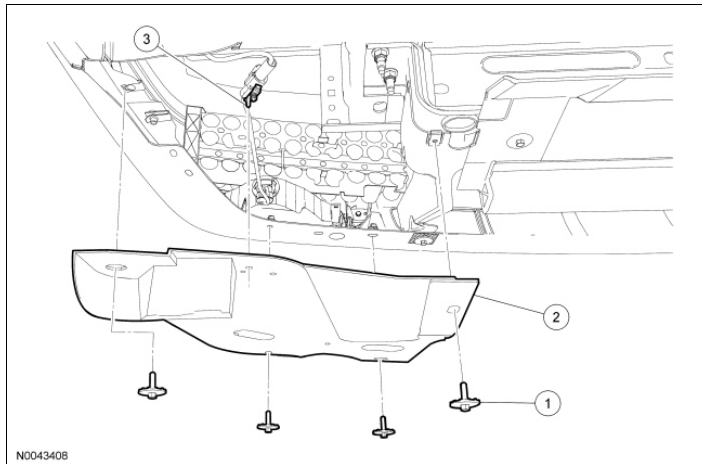
**Removal and Installation**

**NOTE:** Make sure the ignition switch and the headlamp switch are in the OFF position.

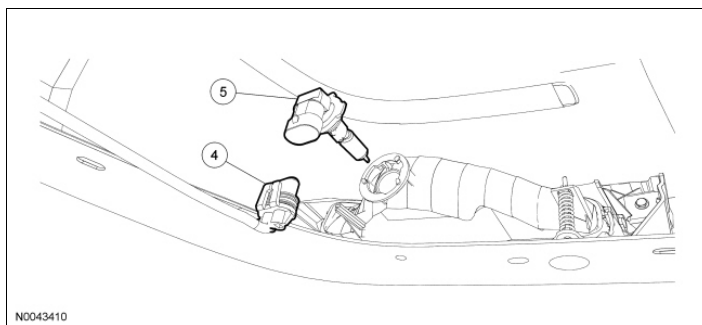
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).
2. Remove the 4 screws and the lower radiator air deflector.
  - Detach the electrical connector locator pin.



3. Remove the 2 bolts and the fog lamp.
    - Disconnect the electrical connector.
  4. To install, reverse the removal procedure.
-

**Fog Lamp Bulb**

Item	Part Number	Description
1	N808841-S	Lower radiator air deflector screws (4 required)
2	8327	Lower radiator air deflector
3	-	Electrical connector locator pin (part of 15A211)



Item	Part Number	Description
4	-	Fog lamp electrical connector (part of 15A211)
5	13466	Fog lamp bulb

**Removal and Installation**

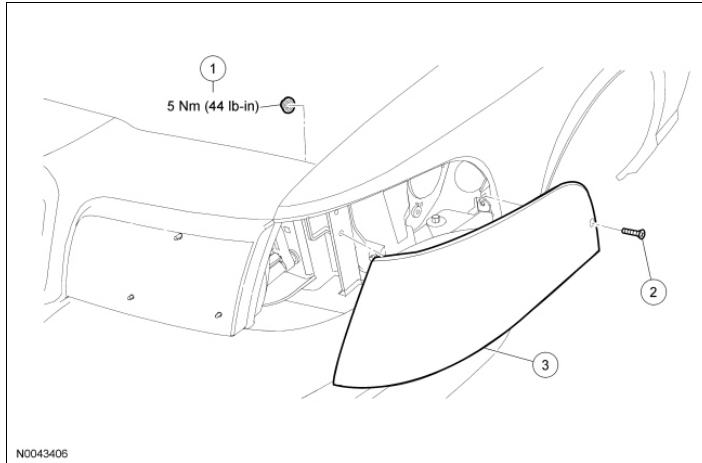
**⚠ WARNING:** The bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope. Failure to follow these instructions may result in personal injury.

**NOTE:** The fog lamp bulb should not be removed from the headlamp until just before a new bulb is installed. Removing the bulb for an extended period of time may affect headlamp bulb performance. Contaminants may enter the fog lamp where they can settle on the lens and reflector. Never turn the fog lamps on with the bulb removed.

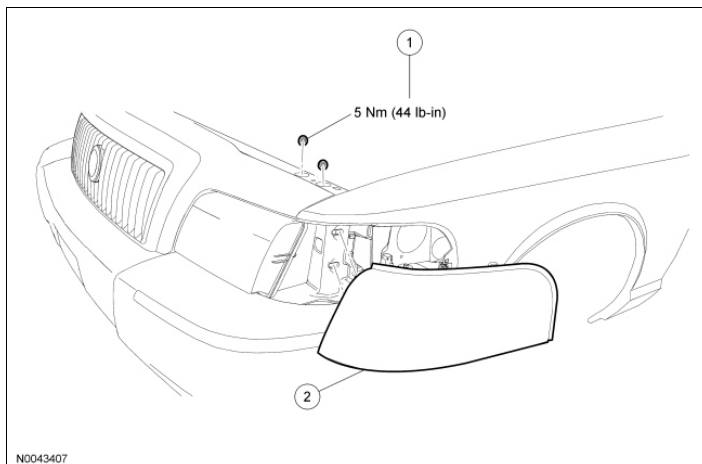
Make sure the ignition switch and the headlamp switch are in the OFF position.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02A](#).

2. Remove the 4 screws and the lower radiator air deflector.
    - Detach the electrical connector locator pin.
  3. Disconnect the electrical connector and remove the fog lamp bulb.
  4. To install, reverse the removal procedure.
-

**Side Turn Signal Lamp****Crown Victoria**

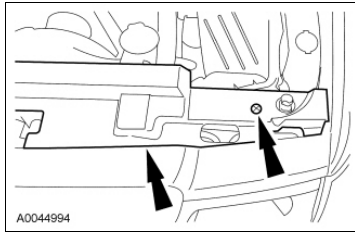
Item	Part Number	Description
1	N621906-S	Side turn signal lamp nut
2	55999	Side turn signal lamp screw
3	15A425/15A424	Side turn signal lamp (LH/RH)

**Grand Marquis**

Item	Part Number	Description
1	N621906-S	Side turn signal lamp nuts (2 required)
2	13201/13200	Side turn signal lamp (LH/RH)

**Removal and Installation****All vehicles**

1. Remove the 3 pin-type retainers and the radiator sight shield.



### **Crown Victoria**

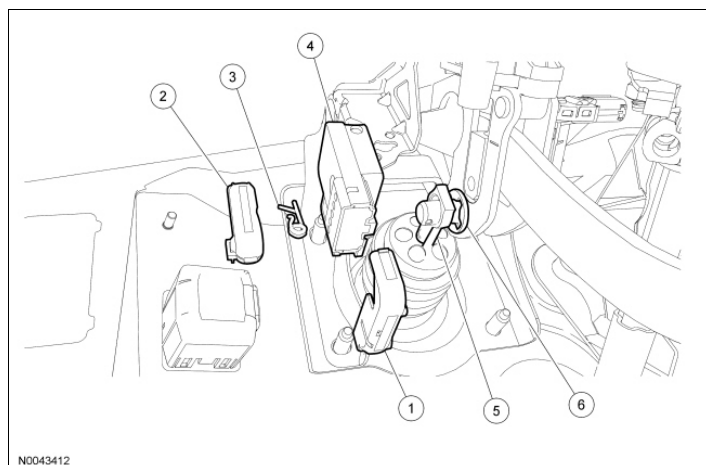
2. Remove the side turn signal lamp screw.
3. Remove the nut and the side turn signal assembly.
  - Disconnect the electrical connector.
  - To install, tighten to 5 Nm (44 lb-in).

### **Grand Marquis**

4. Remove the 2 nuts and the side turn signal assembly.
  - Disconnect the electrical connector.
  - To install, tighten to 5 Nm (44 lb-in).

### **All vehicles**

5. To install, reverse the removal procedure.
-

**Stoplamp Switch**

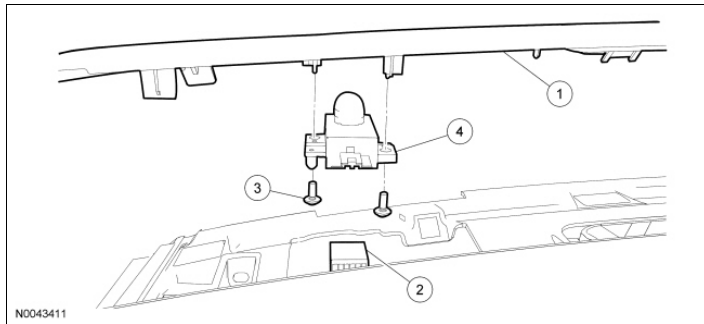
Item	Part Number	Description
1	-	Stoplamp switch electrical connector (part of 14A005)
2	2975	Self-locking pin cover
3	380699	Self-locking pin
4	13480	Stoplamp switch
5	-	Brake booster push rod (part of 2005)
6	-	Bushing

**Removal and Installation**

1. Disconnect the stoplamp switch electrical connector.
2. Remove the cover and the self-locking pin.
3. Remove the stoplamp switch from the brake booster push rod and brake pedal.
4. To install, reverse the removal procedure.



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**Light Sensor**

Item	Part Number	Description
1	54044E82	Defroster grille panel
2	-	Light sensor electrical connector (part of 14401)
3	W701678-S	Light sensor screws (2 required)
4	13A018	Light sensor

**Removal and Installation**

1. **NOTICE:** To avoid damaging the light sensor electrical connector, carefully tilt the panel to expose the connector without stretching the wiring.

Remove the defroster grille panel.

- Disconnect the electrical connector.

2. Remove the 2 screws and the light sensor.
  3. To install, reverse the removal procedure.
-





## Headlamp Switch

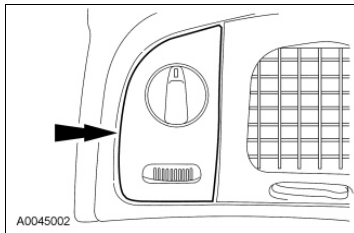
### Removal and Installation

1. **NOTICE:** Cover the end of the tool with tape to prevent damage to the trim panel.

**NOTE:** Use a thin-bladed tool to remove the headlamp switch.

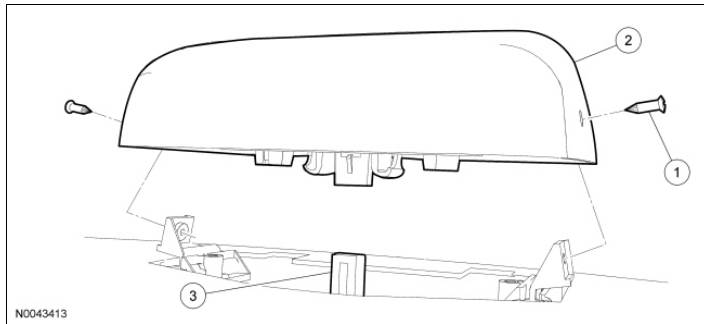
Remove the headlamp switch.

- Disconnect the electrical connectors.



2. To install, reverse the removal procedure.
-

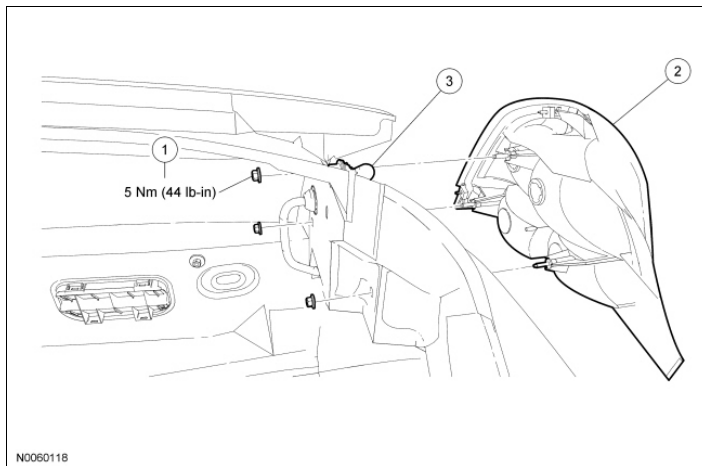
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**High Mounted Stoplamp**

Item	Part Number	Description
1	-	High mounted stoplamp screws (2 required)
2	13A613	High mounted stoplamp
3	-	High mounted stoplamp electrical connector (part of 14A005)

**Removal and Installation**

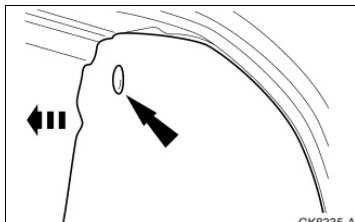
1. Remove the 2 screws and the high mounted stoplamp.
    - Disconnect the electrical connector.
  2. To install, reverse the removal procedure.
-

**Rear Lamp Assembly**

Item	Part Number	Description
1	-	Rear lamp assembly nuts (3 required)
2	13404/13405	Rear lamp assembly (RH/LH)
3	-	Rear lamp assembly bulb holder (part of 13407)

**Removal and Installation**

1. Remove the pin-type retainer and position the luggage compartment trim aside.



2. Remove the 3 nuts and the rear lamp assembly.
  - Remove the bulb sockets from the rear lamp assembly.
  - To install, tighten to 5 Nm (44 lb-in).
3. To install, reverse the removal procedure.



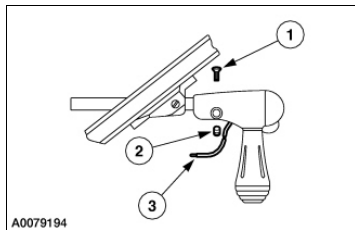
**Spotlamp****Removal and Installation**

**NOTE:** Unity spotlamp shown; all others similar.

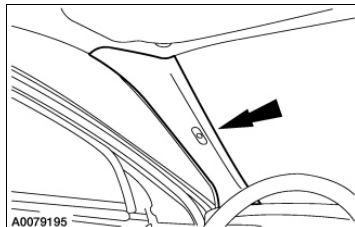
1. Disconnect the battery. For additional information, refer to [Section 414-01](#) .
2. **NOTE:** To remove the handle assembly, the screw and wedge must be completely removed.

Remove the handle assembly.

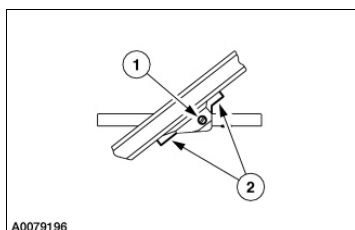
1. Remove the set screw.
2. Remove the wedge.
3. Disconnect the electrical connector.



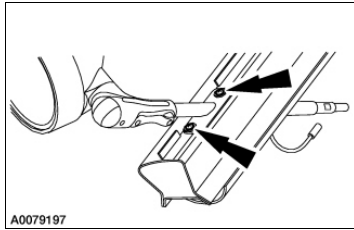
3. Remove the windshield side garnish molding.



4. Remove the inside tube bracket.
  1. Remove the set screw.
  2. Remove the screws.



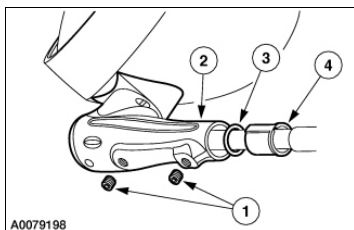
5. Remove the spotlamp assembly.
  - Remove the screws and slide the assembly out.



6. **NOTE:** If the nylon bushing is pulled out of the housing, align the key with the keyway inside the housing to seat it back in the spotlamp housing. If the key does not align with the keyway, the exterior tube cannot be properly reinserted into the spotlamp housing.

Remove the spotlamp.

1. Loosen the set screws.
2. Remove the spotlamp housing from the exterior tube.
3. Remove the O-ring.
4. Remove the nylon bushing.



7. To install, reverse the removal procedure.
-

## Interior Lighting

The interior lighting system consists of the following components:

- Lighting Control Module (LCM)
- Driver Door Module (DDM)
- Instrument panel dimmer switch
- Dome/map combination
- Red/White map lamp (Police if equipped)
- Interior/reading lamps
- Footwell lamps
- Luggage compartment lamp
- Glove compartment lamp
- Vanity mirrors
- Door ajar switches

The interior lighting system consists of 2 subsystems:

- Courtesy lamps
- Demand lamps

Both subsystems use the same power supply circuit through the Central Junction Box (CJB) fuse 18 (15A).

### Courtesy Lamps

The courtesy lamps are controlled by the LCM . The courtesy lamp subsystem consists of the footwell lamps, map lamps and the overhead console lamps. The LCM controls the interior lamps by providing power through circuit 53 (BK/LB).

### Demand Lamps

The demand lamps subsystem consists of the glove compartment lamp, luggage compartment lamp, front map lamps, rear reading lamps, and the left and right vanity mirror lamps. Each of these lamps are switched individually and use a separate ground circuit.

### Dark Car Feature

On police vehicles only, the dark car feature is an option that overrides the illuminated entry function. If the feature is activated, the courtesy lamps do not illuminate during entry or exit of the vehicle. However, the interior lamps still illuminate when switched on from the instrument panel dimmer switch.

The dark car feature is enabled/disabled through programmable parameters in the LCM .




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**Interior Lighting****Special Tool(s)**

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The interior lighting can be separated into 2 distinct modes of operation:

- Courtesy lighting
- Demand lighting

The Lighting Control Module (LCM) controls all of the interior lighting in the vehicle.

**Lighting Control Module (LCM)**

This vehicle uses an LCM to control lighting functions. The LCM is a microprocessor-based module that controls several vehicle subsystems, responds to electrical input signals from various switches, sensors and external modules and is located on the LH side of the instrument panel. The LCM subsystem functions include:

- Headlamps with autolamps
- Turn signal lamps/hazard flasher lamps
- Cornering lamps
- Parking lamps
- Daytime Running Lamps (DRL)
- Fog lamps
- Courtesy lamps
- Demand lamps
- Battery saver

The LCM interfaces with the Driver Door Module (DDM) via the Standard Corporate Protocol (SCP) network for the illuminated entry feature.

The following lamps illuminate for courtesy lighting:

- Front footwell lamps
- Front map lamps

- Rear reading lamps

The following demand lamps are powered by the demand lighting output of the LCM :

- Glove compartment lamp
- Vanity mirror lamps
- Luggage compartment lamp
- Rear reading lamps
- Front map lamps
- Red/white map lamp (Police only)

Each lamp has a dedicated switch that closes to ground to illuminate the lamp.

The front map lamps are powered by either the demand lighting circuit or the courtesy lighting circuit, depending upon the position of the switch associated with each lamp. When the customer turns the front map lamp switch on, the front map lamp is illuminated through power supplied by the LCM demand lighting circuit. If the customer moves the map lamp switch to the OFF position, the power from the LCM demand lighting circuit is interrupted and the lamp is reconnected to the courtesy lighting circuit.

The rear reading lamps are powered by either the courtesy lighting circuit or the demand lighting circuit.

The luggage compartment lamp is controlled by input from the trunk ajar switch and is powered by the demand lighting output from the LCM .

The glove compartment lamp consists of a glove compartment lamp switch and wire and miniature bulb assembly. Opening the glove compartment door closes the switch, which provides power to the glove compartment lamp switch and wire. The glove compartment lamp switch is grounded to the body sheet metal.

The vanity mirror lamp system consists of a switch and bulb assembly in the RH inside visor and the LH inside visor. Lifting the vanity mirror cover closes the vanity mirror lamp switch and provides power to the lamps.

The battery saver has the following inputs:

- Luggage compartment lid door ajar switch
- Ignition switch status
- Illuminated entry message
- Instrument panel dimmer switch
- Door ajar switch
- Remote Keyless Entry (RKE) transmitter
- Door unlock, luggage compartment door release

The battery saver has the following outputs:

- Courtesy lamps
- Demand lamps

When the ignition switch is turned to OFF, the courtesy lamps and demand lamps interrupt timers begin their timeout. The interrupt timer is a feature of the LCM . Power is available to the courtesy and demand lamps during timeout. At the end of the 10 ( $\pm$  1) minute timeout period, the LCM disables power to the headlamps and courtesy lamps. At the end of the 30 minute timeout period, the LCM disables power to the demand lamps. If the instrument panel dimmer switch is causing the courtesy lamps to be on, then timeout is 30 minutes. Turning the ignition switch to ACC or RUN terminates the battery saver feature by disabling the interrupt timers and reinstating power to the lamps.

A reset event sets the courtesy lamps interrupt timer to zero. The reset events for the courtesy lamps and the demand lamps interrupt timer are as follows:

- Turning on the courtesy lamps using the instrument panel dimmer switch
- Opening any door (as detected by the door ajar switches)
- Luggage compartment lid ajar
- Any RKE transmitter button pressed

When the panic button is pressed on an RKE transmitter, the panic alarm overrides the courtesy lamps, demand lamps and headlamps battery saver functions for the necessary duration of the alarm.

### Inspection and Verification

**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 419-03** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical and electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Door ajar switches</li> <li>• Interior lamp switches</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse 18 (15A)</li> <li>• Lighting Control Module (LCM)</li> <li>• Driver Door Module (DDM)</li> <li>• Wiring, terminals or connectors</li> <li>• Bulb(s)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to **Section 418-00** , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:
  - Verify the ignition key is in the ON position.

- Verify the scan tool operation with a known good vehicle.
  - Refer to Section 418-00 to diagnose no response from the PCM.
7. Carry out the network test.
- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
  - If the network test passes, retrieve and record the continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM and the DDM .
9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### Lighting Control Module (LCM) DTC Chart

DTC	Description	Action
B1334	Decklid Ajar Rear Door Circuit Short To Ground	<u>GO to Pinpoint Test J</u> .
B1688	Lamp Dome Input Circuit Short to Ground	<u>GO to Pinpoint Test C</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

### Driver Door Module (DDM) DTC Chart

DTC	Description	Action
B1322	Driver Door Ajar Circuit Short to Ground	<u>GO to Pinpoint Test C</u> .
B1566	Door Ajar Circuit Short to Ground	<u>GO to Pinpoint Test C</u> .
All other DTCs	-	REFER to the Diagnostic Trouble Code (DTC) Chart in <u>Section 419-10</u> .

## Symptom Chart

Symptom Chart

## Pinpoint Tests

**Pinpoint Test A: The Courtesy Lamps Are Inoperative**

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

**Normal Operation**

The Lighting Control Module (LCM) monitors the instrument panel dimmer switch status to determine if the courtesy lamps are requested. Based on the instrument panel dimmer switch status, the LCM energizes the interior lamps.

Fuse 18 (15A) in the Central Junction Box (CJB) provides power to the LCM . The Driver Door Module (DDM) monitors the LH front door ajar switch. The door ajar switches provide a path for ground supplied through the ajar switches, indicating an open door. The DDM then sends a message over the Standard Corporate Protocol (SCP) to command the LCM to supply power to the courtesy lamps.

**This pinpoint test is intended to diagnose the following:**

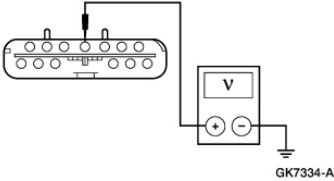
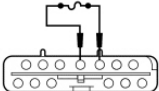
- Fuse
- Wiring, terminals or connectors
- LCM

**PINPOINT TEST A: THE COURTESY LAMPS ARE INOPERATIVE**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The LCM may be configured for a police vehicle. In the police configuration, the LCM ignores the door ajar switch inputs for interior lighting. Check the LCM for correct configuration before continuing diagnostics.

Test Step	Result / Action to Take
<b>A1 CHECK THE DRIVER DOOR AJAR INPUT</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM driver door PIDs (D_DR_SW and P_DR_SW) while opening and closing the doors.</li> <li>• <b>Do the DDM PID values agree with the door positions?</b></li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test D</u> .</p>
<b>A2 CHECK THE LCM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Measure the voltage between the LCM C2145c-4, circuit 54 (LG/YE), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>A3</u> .</p> <p><b>No</b> VERIFY the CJB fuse 18 (15A) is OK. If OK, REPAIR circuit 54 (LG/YE) for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit</p>

 <p>• <b>Is the voltage greater than 10 volts?</b></p>	short.
<b>A3 BYPASS THE LCM</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> If the fuse fails, repair circuit 53 (BK/LB) for a short to ground.</li> <li>• Connect a fused jumper wire between the LCM C2145c-4, circuit 54 (LG/YE), harness side and the LCM C2145c-5, circuit 53 (BK/LB), harness side.</li> </ul>  <p>N0035321</p> <p>• <b>Do the interior lamps illuminate?</b></p>	<p><b>Yes</b> REMOVE the jumper wire. GO to <b>A4</b>.</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 53 (BK/LB) for an open. TEST the system for normal operation.</p>
<b>A4 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <b>Section 419-10</b> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test B: An Individual Courtesy Lamp Is Inoperative**

Refer to Wiring Diagrams Cell **89** , Interior Lamps for schematic and connector information.

**Normal Operation**

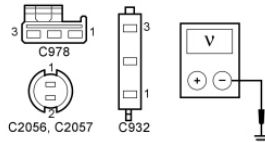
The Lighting Control Module (LCM) supplies voltage to the courtesy lamps.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Interior lamp

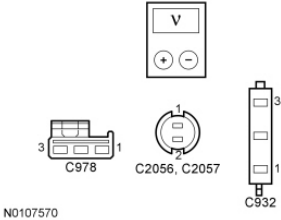
**PINPOINT TEST B: AN INDIVIDUAL COURTESY LAMP IS INOPERATIVE**

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take															
<b>B1 CHECK THE COURTESY LAMP INPUT CIRCUIT FOR AN OPEN</b>																
<ul style="list-style-type: none"><li>• Disconnect: Inoperative Courtesy Lamp.</li><li>• Open any door.</li><li>• Measure the voltage between the inoperative courtesy lamp, harness side and ground as follows:</li></ul> <table><thead><tr><th>Location</th><th>Connector-Pin</th><th>Circuit</th></tr></thead><tbody><tr><td>Front interior lamp</td><td>C978-1</td><td>53 (BK/LB)</td></tr><tr><td>LH footwell lamp</td><td>C2056-1</td><td>53 (BK/LB)</td></tr><tr><td>RH footwell lamp</td><td>C2057-1</td><td>53 (BK/LB)</td></tr><tr><td>Rear interior lamp</td><td>C932-2</td><td>53 (BK/LB)</td></tr></tbody></table> <div><p>N0107569</p></div> <ul style="list-style-type: none"><li>• Is the voltage greater than 10 volts?</li></ul>	Location	Connector-Pin	Circuit	Front interior lamp	C978-1	53 (BK/LB)	LH footwell lamp	C2056-1	53 (BK/LB)	RH footwell lamp	C2057-1	53 (BK/LB)	Rear interior lamp	C932-2	53 (BK/LB)	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> REPAIR circuit 53 (BK/LB) for an open. TEST the system for normal operation.</p>
Location	Connector-Pin	Circuit														
Front interior lamp	C978-1	53 (BK/LB)														
LH footwell lamp	C2056-1	53 (BK/LB)														
RH footwell lamp	C2057-1	53 (BK/LB)														
Rear interior lamp	C932-2	53 (BK/LB)														
<b>B2 CHECK FOR VOLTAGE TO THE COURTESY LAMP USING THE CONNECTOR GROUND</b>																
<ul style="list-style-type: none"><li>• Measure the voltage between the inoperative courtesy lamp pins, harness side as follows:</li></ul> <table><thead><tr><th>Location</th><th>Connector-Pin/ Circuit</th><th>Connector-Pin/ Circuit</th></tr></thead><tbody><tr><td>Front interior lamp</td><td>C978-1 53 (BK/LB)</td><td>C978-2 57 (BK)</td></tr><tr><td>LH footwell lamp</td><td>C2056-1 53 (BK/LB)</td><td>C2056-2 57 (BK)</td></tr><tr><td>RH footwell lamp</td><td>C2057-1</td><td>C2057-2</td></tr></tbody></table>	Location	Connector-Pin/ Circuit	Connector-Pin/ Circuit	Front interior lamp	C978-1 53 (BK/LB)	C978-2 57 (BK)	LH footwell lamp	C2056-1 53 (BK/LB)	C2056-2 57 (BK)	RH footwell lamp	C2057-1	C2057-2	<p><b>Yes</b> INSTALL a new interior lamp. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>			
Location	Connector-Pin/ Circuit	Connector-Pin/ Circuit														
Front interior lamp	C978-1 53 (BK/LB)	C978-2 57 (BK)														
LH footwell lamp	C2056-1 53 (BK/LB)	C2056-2 57 (BK)														
RH footwell lamp	C2057-1	C2057-2														



	53 (BK/LB)	57 (BK)
Rear interior lamp	C932-2	C932-3
	53 (BK/LB)	57 (BK)

N0107570

• Is the voltage greater than 10 volts?

### Pinpoint Test C: The Courtesy Lamps Stay On Continuously

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

#### Normal Operation

The Driver Door Module (DDM) monitors the door ajar switch status for each door. When a door is open, the DDM signals the Lighting Control Module (LCM) to supply power to the courtesy lamps. The LCM also monitors the dome lamp switch status from the instrument panel dimmer switch. When the LCM recognizes that the dome lamps have been requested, the LCM supplies power to the courtesy lamps.

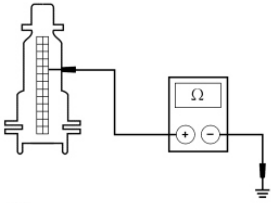
- DTC B1322 (Driver Door Ajar Circuit Short to Ground) - an on-demand DTC sets when the DDM senses a short to ground from the driver door ajar input circuit.
- DTC B1566 (Door Ajar Circuit Short to Ground) - an on-demand DTC sets when the DDM senses a short to ground from any of the passenger door ajar inputs circuit.
- DTC B1688 (Lamp Dome Input Circuit Short to Ground) - an on-demand DTC sets when the LCM senses a short to ground from the dome lamp switch input circuit.

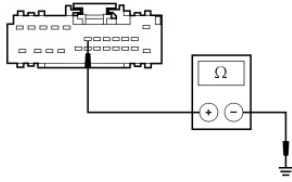
**This pinpoint test is intended to diagnose the following:**

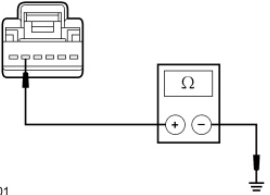
- Wiring, terminals or connectors
- Door ajar switch
- Instrument panel dimmer switch
- DDM
- LCM

#### PINPOINT TEST C: THE COURTESY LAMPS STAY ON CONTINUOUSLY

Test Step	Result / Action to Take
<b>C1 CHECK THE DOOR AJAR PID STATUS WITH THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Close all the doors.</li> </ul>	<p><b>Yes</b> GO to <u>C8</u> .</p> <p><b>No</b></p>

<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM door ajar PIDs (D_DR_SW and P_DR_SW).</li> <li>• <b>Do the door ajar PIDs match the door positions?</b></li> </ul>	<p>For the LH front door, GO to <u>C2</u> . For the RH front, RH or LH rear door, GO to <u>C4</u> .</p>
<b>C2 CHECK THE LH FRONT DOOR AJAR SWITCH FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LH Front Door Ajar Switch C526a.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM LH front door ajar PID (D_DR_SW).</li> <li>• <b>Did the door ajar PID change with the switch disconnected?</b></li> </ul>	<p><b>Yes</b> INSTALL a new door ajar switch. REFER to <u>Section 501-14</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>C3</u> .</p>
<b>C3 CHECK THE LH FRONT DOOR AJAR SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between the DDM C501a-22, circuit 867 (DB), harness side and ground.</li> </ul>  <p>N0037253</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>C12</u> .</p> <p><b>No</b> REPAIR circuit 867 (DB) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<b>C4 CHECK THE RH FRONT DOOR AJAR SWITCH FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RH Front Door Ajar Switch C602a.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM door ajar PID (P_DR_SW).</li> <li>• <b>Did the door ajar PID change with the switch disconnected?</b></li> </ul>	<p><b>Yes</b> INSTALL a new door ajar switch. REFER to <u>Section 501-14</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>C5</u> .</p>
<b>C5 CHECK THE RH REAR DOOR AJAR SWITCH FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: RH Rear Door Ajar Switch C820a.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM door ajar PID (P_DR_SW).</li> </ul>	<p><b>Yes</b> INSTALL a new door ajar switch. REFER to <u>Section 501-14</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b></p>

<ul style="list-style-type: none"> <li>• Did the door ajar PID change with the switch disconnected?</li> </ul>	GO to <u>C6</u> .
<b>C6 CHECK THE LH REAR DOOR AJAR SWITCH FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LH Rear Door Ajar Switch C715a.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM DataLogger.</li> <li>• Monitor the DDM door ajar PID (P_DR_SW).</li> <li>• Did the door ajar PID change with the switch disconnected?</li> </ul>	<p><b>Yes</b> INSTALL a new door ajar switch. REFER to <u>Section 501-14</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>C7</u> .</p>
<b>C7 CHECK THE RH FRONT DOOR AJAR SWITCH SIGNAL CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501b.</li> <li>• Measure the resistance between the DDM C501b-7, circuit 627 (BK/OG), harness side and ground.</li> </ul>  <p>N0037254</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C12</u> .</p> <p><b>No</b> REPAIR circuit 627 (BK/OG) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>
<b>C8 CHECK THE INSTRUMENT PANEL DIMMER SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Instrument Panel Dimmer Switch C205b.</li> <li>• <b>NOTE:</b> Make sure the doors are closed.</li> <li>• Observe the courtesy lamps.</li> <li>• Are the courtesy lamps still illuminated?</li> </ul>	<p><b>Yes</b> GO to <u>C9</u> .</p> <p><b>No</b> INSTALL a new instrument panel dimmer switch. REFER to <u>Section 413-00</u> . CLEAR the DTCs. REPEAT the self-test.</p>
<b>C9 CHECK THE HEADLAMP SWITCH INPUT CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145b.</li> <li>• Measure the resistance between the instrument panel dimmer switch C205b-5, circuit 1034 (BK/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>C10</u> .</p> <p><b>No</b> REPAIR circuit 1034 (BK/WH) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>

 <p>A0072401</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<b>C10 CHECK THE COURTESY LAMP INPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145c.</li> <li>• Observe the courtesy lamps.</li> <li>• Are the courtesy lamps still illuminated?</li> </ul>	<p><b>Yes</b> REPAIR circuit 53 (BK/LB) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C11</u> .</p>
<b>C11 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>C12 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test D: The Courtesy Lamps Do Not Turn On With One Door Open

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

#### Normal Operation

The Driver Door Module (DDM) monitors the LH front door ajar switch. The door ajar switches provide a path for ground supplied through the ajar switches, indicating an open door. The DDM then signals the Lighting Control Module (LCM) to supply power to the courtesy lamps.

**This pinpoint test is intended to diagnose the following:**

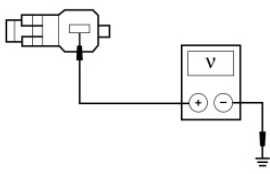
Normal Operation

- Wiring, terminals or connectors
- Door ajar switch
- DDM

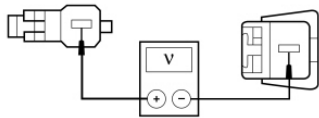
**PINPOINT TEST D: THE COURTESY LAMPS DO NOT TURN ON WITH ONE DOOR OPEN**

**NOTE:** The LCM may be configured for a police vehicle. In the police configuration, the LCM ignores the door ajar switch inputs for interior lighting. Check the LCM for correct configuration before continuing diagnostics.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take															
<b>D1 CHECK THE SUSPECT DOOR AJAR SWITCH</b>																
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Suspect Door Ajar Switch.</li><li>• Measure the voltage between the suspect door ajar switch connector, harness side and ground as follows:</li></ul> <table border="1"><thead><tr><th>Suspect Door Ajar Switch</th><th>Connector-Pin</th><th>Circuit</th></tr></thead><tbody><tr><td>LH front</td><td>C526a-1</td><td>867 (DB)</td></tr><tr><td>RH front</td><td>C602a-1</td><td>627 (BK/OG)</td></tr><tr><td>LH rear</td><td>C715a-1</td><td>627 (BK/OG)</td></tr><tr><td>RH rear</td><td>C820a-1</td><td>627 (BK/OG)</td></tr></tbody></table> <div><p>N0107536</p></div> <ul style="list-style-type: none"><li>• Is the voltage greater than 10 volts?</li></ul>	Suspect Door Ajar Switch	Connector-Pin	Circuit	LH front	C526a-1	867 (DB)	RH front	C602a-1	627 (BK/OG)	LH rear	C715a-1	627 (BK/OG)	RH rear	C820a-1	627 (BK/OG)	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> GO to <u>D3</u> .</p>
Suspect Door Ajar Switch	Connector-Pin	Circuit														
LH front	C526a-1	867 (DB)														
RH front	C602a-1	627 (BK/OG)														
LH rear	C715a-1	627 (BK/OG)														
RH rear	C820a-1	627 (BK/OG)														
<b>D2 CHECK FOR VOLTAGE TO THE DOOR AJAR SWITCH USING THE CONNECTOR GROUND</b>																
<ul style="list-style-type: none"><li>• Measure the voltage between the suspect door ajar switch connector pins, harness side as follows:</li></ul>	<p><b>Yes</b> INSTALL a new door ajar switch for the switch in question. REFER to <u>Section 501-14</u> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR the ground circuit in</p>															

Suspect Door Ajar Switch	Connector-Pin/ Circuit	Connector-Pin/ Circuit
LH front	C526a-1 867 (DB)	C526b-1 676 (PK/OG)
RH front	C602a-1 627 (BK/OG)	C602b-1 676 (PK/OG)
RH rear	C820a-1 627 (BK/OG)	C820b-1 676 (PK/OG)
LH rear	C715a-1 627 (BK/OG)	C715b-1 676 (PK/OG)



N0107537

- Is the voltage greater than 10 volts?

question for an open. TEST the system for normal operation.

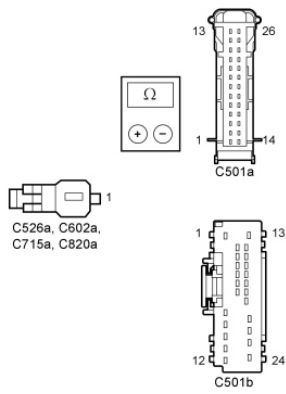
### D3 CHECK THE DOOR AJAR REFERENCE CIRCUIT FOR AN OPEN

- Disconnect: DDM C501a and C501b.
- Measure the resistance between the suspect door ajar switch, harness side and the DDM , harness side as follows:

**Yes**  
GO to D4 .

**No**  
REPAIR the input circuit in question for an open. TEST the system for normal operation.

Suspect Door Ajar Switch	Door Ajar Switch Connector-Pin	DDM Connector-Pin	Circuit
LH front	C526a-1	C501a-22	867 (DB)
RH front	C602a-1	C501b-7	627 (BK/OG)
RH rear	C820a-1	C501b-7	627 (BK/OG)
LH rear	C715a-1	C501b-7	627 (BK/OG)

 <p>N0107538</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<b>D4 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test E: The Demand Lighting Is Inoperative

Refer to Wiring Diagrams Cell [89](#) , Interior Lamps for schematic and connector information.

#### Normal Operation

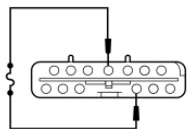
The Lighting Control Module (LCM) provides power to the demand lamps. The demand lamps remain powered for a predetermined amount of time. Once the battery saver timeout has been reached, the LCM removes voltage from the demand lamps.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LCM

#### PINPOINT TEST E: THE DEMAND LIGHTING IS INOPERATIVE

Test Step	Result / Action to Take
<b>E1 CHECK THE COURTESY LAMP OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Open the driver door.</li> <li>• Do the courtesy lamps illuminate?</li> </ul>	<p><b>Yes</b> GO to <a href="#">E2</a> .</p> <p><b>No</b> <a href="#">GO to Pinpoint Test A</a> .</p>

<b>E2 CHECK THE DEMAND LIGHTING INPUT CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> If the fuse fails, repair circuit 705 (LG/OG) for a short to ground.</li> <li>• Connect a fused jumper wire between the LCM C2145c-4, circuit 54 (LG/YE), harness side and the LCM C2145c-18, circuit 705 (LG/OG), harness side.</li> </ul>  <p>N0037239</p> <ul style="list-style-type: none"> <li>• Turn any demand lamp on.</li> <li>• <b>Does the demand lamp illuminate?</b></li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>E3</u> .</p> <p><b>No</b> REMOVE the jumper wire. REPAIR circuit 705 (LG/OG) for an open. TEST the system for normal operation.</p>
<b>E3 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test F: An Individual Demand Lamp Is Inoperative

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) provides power to the demand lamps.

**This pinpoint test is intended to diagnose the following:**

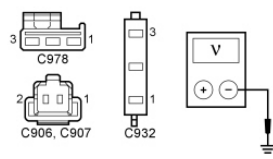
- Wiring, terminals or connectors
- Interior lamp

#### PINPOINT TEST F: AN INDIVIDUAL DEMAND LAMP IS INOPERATIVE

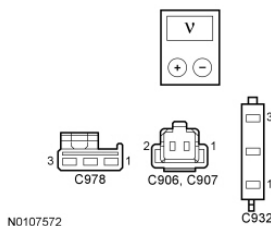
**NOTE:** The battery saver must be activated during this test.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .



Test Step	Result / Action to Take															
<b>F1 VERIFY THE INTERIOR LAMP OPERATION</b>																
<ul style="list-style-type: none"><li>• Open the LH front door.</li><li>• Verify all courtesy lamps illuminate.</li><li>• <b>Do the courtesy lamps illuminate?</b></li></ul>	<p><b>Yes</b> GO to <u>F2</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test A</u> .</p>															
<b>F2 CHECK THE DEMAND LAMP INPUT CIRCUIT FOR AN OPEN</b>																
<ul style="list-style-type: none"><li>• Ignition OFF.</li><li>• Disconnect: Inoperative Demand Lamp.</li><li>• Ignition ON.</li><li>• Measure the voltage between the inoperative demand lamp, harness side and ground as follows:</li></ul> <table><tr><th>Inoperative Demand Lamp</th><th>Connector-Pin</th><th>Circuit</th></tr><tr><td>Front interior</td><td>C978-3</td><td>705 (LG/OG)</td></tr><tr><td>LH vanity mirror</td><td>C907-2</td><td>705 (LG/OG)</td></tr><tr><td>RH vanity mirror</td><td>C906-2</td><td>705 (LG/OG)</td></tr><tr><td>Rear interior</td><td>C932-1</td><td>705 (LG/OG)</td></tr></table> <div><p>N0107571</p></div> <ul style="list-style-type: none"><li>• <b>Is the voltage greater than 10 volts?</b></li></ul>	Inoperative Demand Lamp	Connector-Pin	Circuit	Front interior	C978-3	705 (LG/OG)	LH vanity mirror	C907-2	705 (LG/OG)	RH vanity mirror	C906-2	705 (LG/OG)	Rear interior	C932-1	705 (LG/OG)	<p><b>Yes</b> GO to <u>F3</u> .</p> <p><b>No</b> REPAIR circuit 705 (LG/OG) for an open. TEST the system for normal operation.</p>
Inoperative Demand Lamp	Connector-Pin	Circuit														
Front interior	C978-3	705 (LG/OG)														
LH vanity mirror	C907-2	705 (LG/OG)														
RH vanity mirror	C906-2	705 (LG/OG)														
Rear interior	C932-1	705 (LG/OG)														
<b>F3 CHECK FOR VOLTAGE TO THE DEMAND LAMP USING THE CONNECTOR GROUND</b>																
<ul style="list-style-type: none"><li>• Measure the voltage between the inoperative demand lamp connector pins, harness side as follows:</li></ul> <table><tr><th>Suspect Demand Lamp</th><th>Connector-Pin/ Circuit</th><th>Connector-Pin/ Circuit</th></tr><tr><td>Front interior</td><td></td><td></td></tr></table>	Suspect Demand Lamp	Connector-Pin/ Circuit	Connector-Pin/ Circuit	Front interior			<p><b>Yes</b> INSTALL a new lamp assembly. TEST the system for normal operation.</p> <p><b>No</b> REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.</p>									
Suspect Demand Lamp	Connector-Pin/ Circuit	Connector-Pin/ Circuit														
Front interior																

	C978-3 705 (LG/OG)	C978-2 57 (BK)
LH vanity mirror	C907-2 705 (LG/OG)	C907-1 57 (BK)
RH vanity mirror	C906-2 705 (LG/OG)	C906-1 57 (BK)
Rear interior	C932-1 705 (LG/OG)	C932-3 57 (BK)



- Is the voltage greater than 10 volts?

### Pinpoint Test G: The Battery Saver Does Not Deactivate After Timeout

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

#### Normal Operation

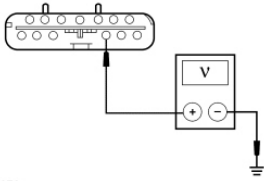
The battery saver provides power to the courtesy lamp for a predetermined time after the ignition switch has been cycled from the ON to the OFF position. Once the predetermined timeout has elapsed, the Lighting Control Module (LCM) deactivates the battery saver and removes power from the courtesy lamp.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- LCM

#### PINPOINT TEST G: THE BATTERY SAVER DOES NOT DEACTIVATE AFTER TIMEOUT

Test Step	Result / Action to Take
<b>G1 CHECK THE DEMAND LAMP OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the LCM C2145c-18, circuit 705 (LG/OG), harness side</li> </ul>	<p><b>Yes</b> REPAIR circuit 705 (LG/OG) for a short to voltage. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>G2</u> .</p>

<p>and ground.</p>  <p>N0035278</p> <p>• Is any voltage present?</p>	
<b>G2 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test H: The Luggage Compartment Lamp Is Inoperative**

Refer to Wiring Diagrams Cell [89](#) , Interior Lamps for schematic and connector information.

**Normal Operation**

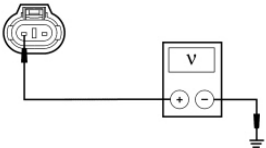
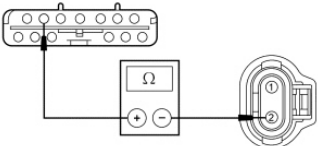
The luggage compartment lamp is controlled by the Lighting Control Module (LCM). The LCM receives a signal from the luggage compartment lid ajar switch. When the luggage compartment lid is opened, the luggage compartment lid ajar switch closes and signals the LCM . The LCM controls the ground side of the luggage compartment lamp.

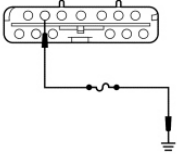
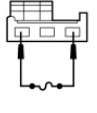
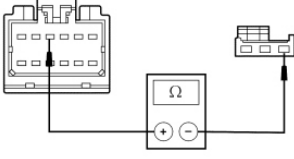
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Luggage lamp assembly
- Luggage compartment lid latch
- LCM

**PINPOINT TEST H: THE LUGGAGE COMPARTMENT LAMP IS INOPERATIVE**

Test Step	Result / Action to Take
<b>H1 CHECK THE DECKLID AJAR PID STATUS WITH THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> </ul>	<p><b>Yes</b> GO to <a href="#">H2</a> .</p>

<ul style="list-style-type: none"> <li>• Open the luggage compartment lid.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM luggage compartment lid PID (DECKLID).</li> <li>• <b>Does the PID match the luggage compartment lid position?</b></li> </ul>	<p><b>No</b> GO to <u>H5</u> .</p>
<p><b>H2 CHECK FOR VOLTAGE TO THE LUGGAGE COMPARTMENT LAMP</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Luggage Compartment Lamp C428.</li> <li>• Measure the voltage between the luggage compartment lamp C428-1, circuit 705 (LG/OG), harness side and ground.</li> </ul>  <p>N0090096</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 10 volts?</b></li> </ul>	<p><b>Yes</b> GO to <u>H3</u> .</p> <p><b>No</b> REPAIR circuit 705 (LG/OG) for an open. TEST the system for normal operation.</p>
<p><b>H3 CHECK THE LUGGAGE COMPARTMENT LAMP GROUND CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145d.</li> <li>• Measure the resistance between the LCM C2145d-9, circuit 1092 (PK/OG), harness side and the luggage compartment lamp C428-2, circuit 1092 (PK/OG), harness side.</li> </ul>  <p>N0037240</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>H4</u> .</p> <p><b>No</b> REPAIR circuit 1092 (PK/OG) for an open. TEST the system for normal operation.</p>
<p><b>H4 CHECK THE LUGGAGE COMPARTMENT LAMP OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Connect: Luggage Compartment Lamp C428.</li> <li>• Connect a fused jumper wire between the LCM C2145d-9, circuit 1092 (PK/OG), harness side and ground.</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. GO to <u>H8</u> .</p> <p><b>No</b> REMOVE the jumper wire. INSTALL a new luggage compartment lamp assembly. TEST the system for normal operation.</p>

 <p>N0037241</p> <ul style="list-style-type: none"> <li>• Does the luggage lamp illuminate?</li> </ul>	
<b>H5 CHECK THE LUGGAGE COMPARTMENT LID RELEASE SOLENOID OPERATION</b>	
<ul style="list-style-type: none"> <li>• Operate the luggage compartment lid release solenoid.</li> <li>• Does the luggage compartment lid release operate?</li> </ul>	<p><b>Yes</b> GO to <u>H6</u> .</p> <p><b>No</b> REFER to <u>Section 501-14</u> to continue diagnosis of the luggage compartment lid release system.</p>
<b>H6 CHECK THE LUGGAGE COMPARTMENT LID AJAR SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Luggage Compartment Lid Latch C430.</li> <li>• Connect a fused jumper wire between the luggage compartment lid latch C430-1, circuit 486 (BN/WH), harness side and the luggage compartment lid latch C430-3, circuit 57 (BK), harness side.</li> </ul>  <p>N0044453</p> <ul style="list-style-type: none"> <li>• Does the luggage compartment lamp illuminate?</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new luggage compartment lid latch. REFER to <u>Section 501-14</u> . TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>H7</u> .</p>
<b>H7 CHECK THE LUGGAGE COMPARTMENT LID AJAR SWITCH SIGNAL CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145b.</li> <li>• Measure the resistance between the luggage compartment lid ajar switch C430-1, circuit 486 (BN/WH), harness side and the LCM 2145b-4, circuit 486 (BN/WH), harness side.</li> </ul>  <p>N0044454</p>	<p><b>Yes</b> GO to <u>H8</u> .</p> <p><b>No</b> REPAIR circuit 486 (BN/WH) for an open. TEST the system for normal operation.</p>

• Is the resistance less than 5 ohms?	
<b>H8 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Section 419-10</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test I: The Courtesy Lamps Are Inoperative - From The Instrument Panel Dimmer Switch

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) monitors the instrument panel dimmer switch status to determine if the courtesy lamps are requested. Based on the instrument panel dimmer switch status, the LCM provides voltage to the courtesy lamps.

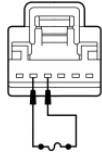
#### This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Instrument panel dimmer switch
- LCM

### PINPOINT TEST I: THE COURTESY LAMPS ARE INOPERATIVE - FROM THE INSTRUMENT PANEL DIMMER SWITCH

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>I1 BYPASS THE INSTRUMENT PANEL DIMMER SWITCH</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Instrument Panel Dimmer Switch C205b.</li> <li>• Connect a fused jumper wire between the instrument panel dimmer switch C205b-5, circuit 1034 (BK/WH), harness side and the instrument panel dimmer switch C205b-4, circuit 57 (BK), harness side.</li> </ul>	<p><b>Yes</b> REMOVE the jumper wire. INSTALL a new instrument panel dimmer switch. REFER to <u>Section 413-00</u> . TEST the system for normal operation.</p> <p><b>No</b> REMOVE the jumper wire. GO to <u>I2</u> .</p>



N0037249

- Do the courtesy lamps illuminate?

## I2 CHECK THE INSTRUMENT PANEL DIMMER SWITCH GROUND CIRCUIT FOR AN OPEN

- Disconnect: Negative Battery Cable.
- Measure the resistance between the instrument panel dimmer switch C205b-4, circuit 57 (BK), harness side and ground.



A0072403

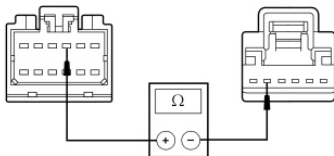
- Is the resistance less than 5 ohms?

**Yes**GO to I3.**No**

REPAIR circuit 57 (BK) for an open. TEST the system for normal operation.

## I3 CHECK THE INSTRUMENT PANEL DIMMER SWITCH SIGNAL CIRCUIT FOR AN OPEN

- Disconnect: LCM C2145b.
- Measure the resistance between the LCM C2145b-3, circuit 1034 (BK/WH), harness side and the instrument panel dimmer switch C205b-5, circuit 1034 (BK/WH), harness side.



N0037250

- Is the resistance less than 5 ohms?

**Yes**GO to I4.**No**

REPAIR circuit 1034 (BK/WH) for an open. TEST the system for normal operation.

## I4 CHECK FOR CORRECT LCM OPERATION

- Disconnect all the LCM connectors.
- Check for:
  - ◆ corrosion
  - ◆ damaged pins
  - ◆ pushed-out pins
- Connect all the LCM connectors and make sure they seat correctly.

**Yes**INSTALL a new LCM . REFER to Section 419-10 . TEST the system for normal operation.**No**

The system is operating correctly at this time. The concern may have been caused by a loose or corroded

<ul style="list-style-type: none"> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	connector.
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**Pinpoint Test J: DTC B1334**

Refer to Wiring Diagrams Cell 89 , Interior Lamps for schematic and connector information.

**Normal Operation**

The luggage compartment lamp is controlled by the Lighting Control Module (LCM). The LCM receives a signal from the luggage compartment lid ajar switch. When the luggage compartment lid is opened, the luggage compartment lid ajar switch closes and signals the LCM .

DTC B1334 (Decklid Ajar Rear Door Circuit Short To Ground) - an on-demand DTC that sets if the LCM detects a short to ground from the decklid ajar circuit.

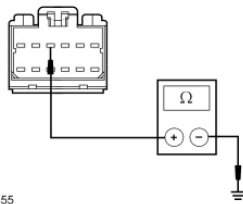
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Luggage compartment lid latch
- LCM

**PINPOINT TEST J: DTC B1334**

Test Step	Result / Action to Take
<b>J1 CHECK THE LUGGAGE COMPARTMENT LID AJAR PID STATUS WITH THE SCAN TOOL</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: LCM DataLogger.</li> <li>• Monitor the LCM luggage compartment lid PID (DECKLID).</li> <li>• Disconnect: Luggage Compartment Lid Release Latch C430.</li> <li>• <b>Does the luggage compartment lid PID change?</b></li> </ul>	<p><b>Yes</b> INSTALL a new luggage compartment lid latch. REFER to <u>Section 501-14</u> . CLEAR the DTCs. REPEAT the self-test.</p> <p><b>No</b> GO to <u>J2</u> .</p>
<b>J2 CHECK THE LUGGAGE COMPARTMENT LID RELEASE SOLENOID SIGNAL CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145b.</li> <li>• Measure the resistance between the LCM C2145b-4, circuit 486 (BN/WH), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>J3</u> .</p> <p><b>No</b> REPAIR circuit 486 (BN/WH) for a short to ground. CLEAR the DTCs. REPEAT the self-test.</p>





- Is the resistance greater than 10,000 ohms?

### J3 CHECK FOR CORRECT LCM OPERATION

- Disconnect all the LCM connectors.
- Check for:
  - ◆ corrosion
  - ◆ damaged pins
  - ◆ pushed-out pins
- Connect all the LCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- Is the concern still present?

#### Yes

INSTALL a new LCM . REFER to [Section 419-10](#) . TEST the system for normal operation.

#### No

The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

**Communications Network**

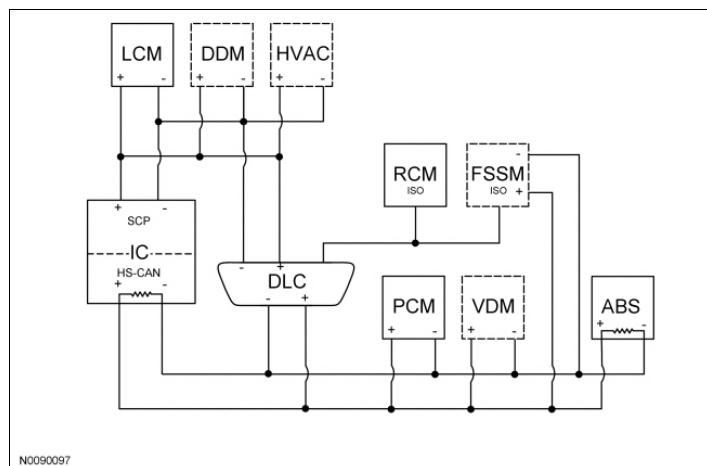
**NOTE:** The Smart Junction Box (SJB) is also known as the Generic Electronic Module (GEM).

Multiplexing is a method of sending 2 or more signals simultaneously over a single circuit. Multiplexing is used to allow 2 or more electronic modules (nodes) to communicate simultaneously over a twisted-wire pair [data (+) and data (-)] network. The information or messages that can be communicated in these wires consists of commands, status or data. The advantage of using multiplexing is to reduce the weight of the vehicle by reducing the number of redundant components and electrical wiring.

The 3 module communication networks are:

- High Speed Controller Area Network (HS-CAN)
- ISO 9141
- Standard Corporate Protocol (SCP)

Information is sent to and from individual control modules that each control specific functions. All 3 networks are connected to the Data Link Connector (DLC). The DLC can be found under the instrument panel between the steering column and the audio unit. The ISO 9141 network is for diagnostic use only.

**Network Topology**

Module Name	Network Type	Termination Module
ABS module	HS-CAN	Yes
Driver Door Module (DDM) (if equipped)	SCP	N/A
Fire Suppression System Module (FSSM) (police only, if equipped)	HS-CAN	No
	ISO 9141	N/A
HVAC module (if equipped)	SCP	N/A
Instrument Cluster (IC) (gateway module)	HS-CAN	Yes
	SCP	N/A
Lighting Control Module (LCM)	SCP	N/A

PCM	HS-CAN	No
Restraints Control Module (RCM)	ISO 9141	N/A
Vehicle Dynamics Module (VDM) (if equipped)	HS-CAN	No

### High Speed Controller Area Network (HS-CAN)

The HS-CAN uses an unshielded twisted pair cable, data bus (+) and data bus (-) circuits. In addition to scan tool communication, this network allows sharing of information between all modules on the network.

### ISO 9141 Network

The ISO 9141 communication network is a single wire network, used for diagnostic purposes only.

### Standard Corporate Protocol (SCP) Communication Network

The SCP network has an unshielded twisted pair cable, data bus (+) and data bus (-) circuits. In addition to scan tool communication, this network allows sharing of information between all modules on the network.

### Network Termination

The HS-CAN uses a network termination circuit to improve communication reliability. The network termination of the HS-CAN bus takes place inside the termination modules (ABS module and IC ) by termination resistors. Termination modules are located at either end of the bus network. As network messages are broadcast, in the form of voltage signals, the network voltage signals are stabilized by the termination resistors. Each termination module has a 120 ohm resistor across the positive and negative bus connection in the termination module. With 2 termination modules on each network, and the 120 ohm resistors located in a parallel circuit configuration, the total network impedance (resistance) is 60 ohms.

Network termination improves bus message reliability by:

- stabilizing bus voltage.
- eliminating electrical interference.




### Gateway Module

The IC is the gateway module, translating HS-CAN to SCP and vice versa. This information allows a message to be distributed throughout both networks. The IC is the only module on this vehicle that has this ability.



**Communications Network**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The 3 module communication networks are:

- High Speed Controller Area Network (HS-CAN)
- ISO 9141
- Standard Corporate Protocol (SCP)

Information is sent to and from individual control modules that each control specific functions. All 3 networks are connected to the Data Link Connector (DLC). The DLC can be found under the instrument panel between the steering column and the audio unit. The ISO 9141 network is for diagnostic use only while the HS-CAN and SCP network allow multiple modules to communicate (transfer data) with each other on a common network.

**ISO 9141 Communications Network**

The ISO 9141 network is a single wire network. The ISO 9141 network does not permit intermodule communication. When the scan tool communicates to modules on the ISO 9141 network, the scan tool must request all information; the modules cannot initiate communications. The ISO 9141 network operates at a maximum data transfer speed of 10.4 Kbps.

The following fault chart describes the specific ISO 9141 network failures and their resulting symptom:

**ISO 9141 Network Fault Chart**

Failure Description	Symptom
ISO 9141 circuit open	No communication
ISO 9141 circuit short to voltage	No communication

ISO 9141 circuit short to ground	No communication
Module loss of voltage or ground	No communication
Module internal failure	No communication

### Standard Corporate Protocol (SCP) Network

The SCP network uses an unshielded twisted pair cable of data (+) and data (-) circuits. The data (+) circuit is regulated to approximately 0.5 volts and the data (-) circuits to approximately 4.5 volts during neutral or rested network traffic. Voltage on data circuits increases/decreases as bus messages are sent. Multiple bus messages can be sent over the network SCP circuits allowing network modules to communicate with each other. The SCP network operates at a maximum data transfer speed of 41.6 Kbps and remains operational at a degraded level if one of the bus wires becomes open or shorted to ground or voltage.

### SCP Network Fault Chart

Failure Description	Symptom
SCP (+) shorted to SCP (-)	No communication
SCP (+) short to voltage	Unreliable communication during high data transfer events
SCP (-) short to voltage	Unreliable communication during high data transfer events
SCP (+) short to ground	Unreliable communication during high data transfer events
SCP (-) short to ground	Unreliable communication during high data transfer events
SCP (+) open	Unreliable communication during high data transfer events
SCP (-) open	Unreliable communication during high data transfer events
Module loss of voltage or ground	No communication
Module internal failure	No communication

### High Speed Controller Area Network (HS-CAN)

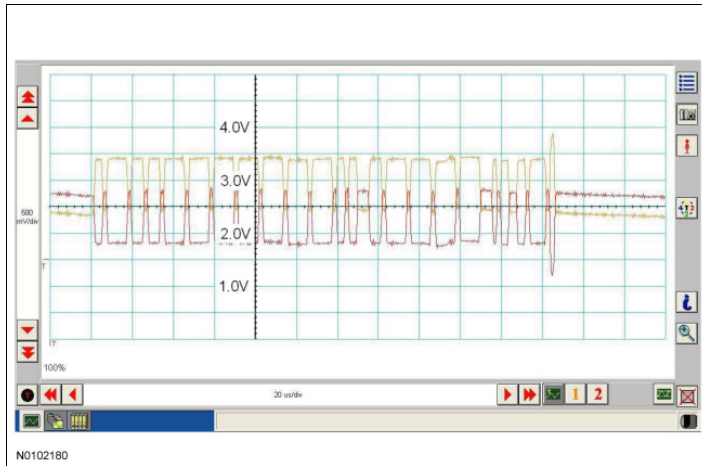
The HS-CAN uses an unshielded twisted pair cable of data (+) and data (-) circuits. The data (+) and the data (-) circuits are each regulated to approximately 2.5 volts during neutral or rested network traffic. As bus messages are sent on the data (+) circuit, voltage is increased by approximately 1.0 volt. Inversely, the data (-) circuit is reduced by approximately 1.0 volt when a bus message is sent. Multiple bus messages can be sent over the HS-CAN circuits allowing network modules to communicate with each other.

### Controller Area Network (CAN) Fault Tolerance

**NOTE:** The oscilloscope traces below are from the Integrated Diagnostic System (IDS) oscilloscope taken using the IDS pre-configured Controller Area Network (CAN) settings. The traces are for both data (+) and data (-) circuits taken simultaneously (2-channel) at sample rate of 1 mega-sample per second (1MS/s) or greater.

Traces below are viewed at 500mV per division (vertical axis) and 20 microseconds (20 $\mu$ s) per division (horizontal axis). Readings taken with a different oscilloscope vary from those shown. Compare any suspect readings to a known good vehicle.

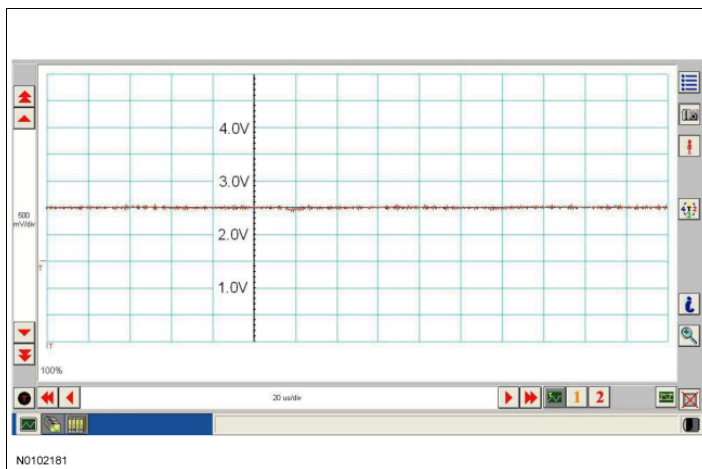
### Normal CAN Operation



The data (+) and data (-) circuits are each regulated to approximately 2.5 volts during neutral or rested network traffic. As messages are sent on the data (+) circuit, voltage is increased by approximately 1.0 volt. Inversely, the data (-) circuit is reduced by approximately 1.0 volt when a message is sent.

Successful communication of a message can usually be identified by the slight spike at the end of a message transmission. Any signals that are significantly different than the normal CAN waveform may cause network DTCs (U-codes) to set or may cause a complete network outage.

### CAN Circuits Shorted Together



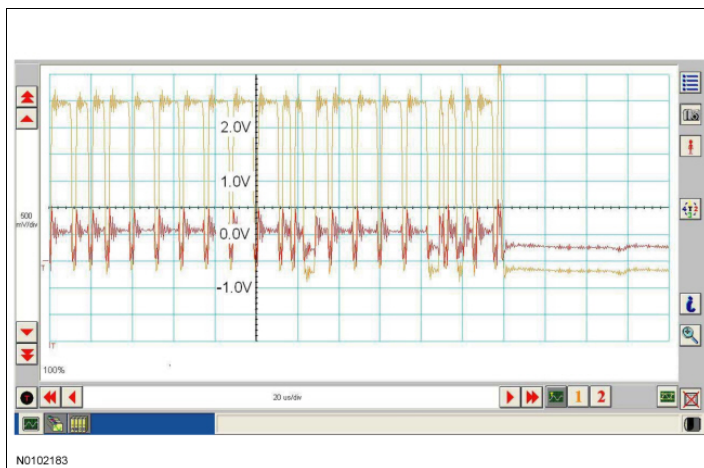
In the event that the data (+) and data (-) circuits become shorted together, the signal stays at base voltage (2.5V) continuously and all communication capabilities are lost.

### CAN (+) Circuit Shorted To Ground



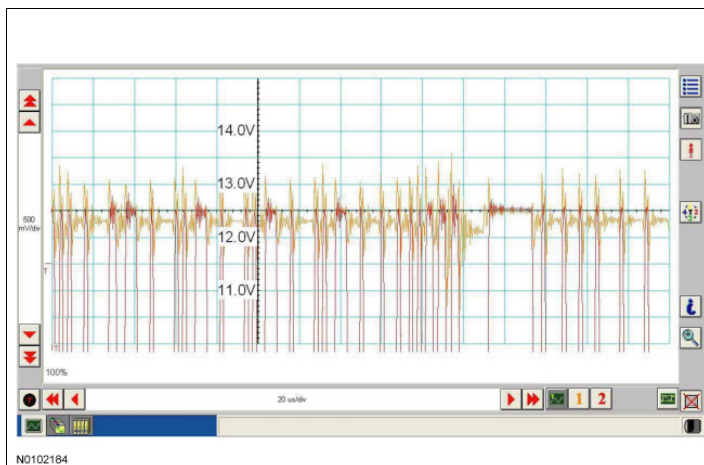
In the event that the data (+) circuit becomes shorted to ground, both the data (+) and data (-) circuits are pulled low (0V) and all communication capabilities are lost.

#### **CAN (-) Circuit Shorted To Ground**



In the event that the data (-) circuit becomes shorted to ground, the data (-) circuit is pulled low (0V) and the data (+) circuit reaches near-normal peak voltage (3.0V) during communication but falls to 0V instead of normal base voltage (2.5V). Communication may continue but at a degraded level.

#### **CAN (+) Circuit Shorted To Battery Voltage**

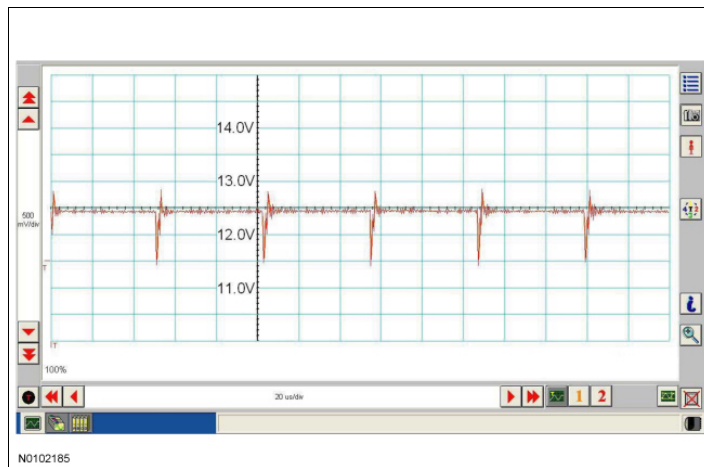


In the event that the data (+) circuit becomes shorted to battery voltage, the data (+) circuit is pulled high



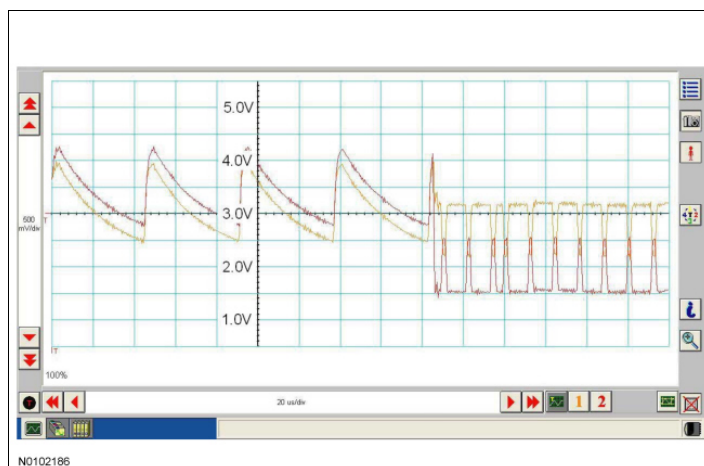
(12V) and the data (-) circuit falls to abnormally high voltage (above 5V) during communication and reaches battery voltage (12V) for peak voltage. Communication may continue but at a degraded level.

#### CAN (-) Circuit Shorted To Battery Voltage



In the event that the data (-) circuit becomes shorted to battery voltage, both the data (+) and data (-) circuits are pulled high (12V) and all communication capabilities are lost.

#### CAN Circuit Signal Corruption



Rhythmic oscillations, inductive spikes or random interference can corrupt the network communications. The corruption signal source may be outside electrical interference such as motors or solenoids or internal interference generated from a module on the network. In some cases, an open in either the data (+) or data (-) circuit to a network module may cause the module to emit interference on the one circuit which is still connected. The trace shown is an example of a "sawtooth" pattern transmitted from a module with one open network circuit.

Other corruptions may be present when a module is intermittently powered up and down. The module on power up may initiate communication out of sync with other modules on the network causing momentary communication outages.

#### Controller Area Network (CAN) Multiplex Messages

Modules in the CAN utilize simultaneous communication of 2 or more message on the same network circuits. The following chart summarizes the messages sent and received on the network.

**NOTE:** Some HS-CAN faults may result in a no-start condition.

### CAN Module Communicatin Message Chart

Broadcast Message	Originating Module	Network Type	Receiving Module(s)
A/C clutch request	IC	HS-CAN	• PCM
A/C clutch request via CAN	IC	HS-CAN	• PCM
A/C clutch status	PCM	HS-CAN	• IC
ABS event in progress	ABS module	HS-CAN	• PCM
ABS/trac indicator on request	ABS module	HS-CAN	• IC
ABS/trac system configuration	ABS module	HS-CAN	• IC
ABS/trac system status	ABS module	HS-CAN	• PCM
Air suspension status	Vehicle Dynamics Module (VDM)	HS-CAN	• IC
Ambient temperature	HVAC module	SCP	• IC
Anti-theft system status request	Driver Door Module (DDM)	SCP	• LCM
Anti-theft system status	Lighting Control Module (LCM)	SCP	• DDM
Autolamp indicator request	Instrument Cluster (IC)	SCP	• LCM
Autolamp indicator status	LCM	SCP	• IC
Axle ratio	PCM	HS-CAN	• ABS module • IC
Barometric pressure	PCM	HS-CAN	• IC
Barometric pressure (gateway)	IC	SCP	• DDM
Brake malfunction indicator request	ABS module	HS-CAN	• IC
Brake switch status	ABS module	HS-CAN	• PCM
Brake switch status	LCM	SCP	• DDM

Charging system warning indicator request	PCM	HS-CAN	• IC
Chime on request	IC	SCP	• LCM
Decklid ajar status	DDM	SCP	• LCM
Decklid ajar status	LCM	SCP	• IC
Decklid ajar status request	IC	SCP	• LCM
Door ajar status (LF, RF)	IC	HS-CAN	• VDM
Door ajar status request (LF)	IC	SCP	• DDM
Door ajar status request (LF)	LCM	SCP	• DDM
Door ajar status (LF)	DDM	SCP	• IC • LCM
Door ajar status request (RF)	IC	SCP	• DDM
Door ajar status request (RF)	LCM	SCP	• DDM
Door lock status	DDM	SCP	• LCM
Door lock switch status	DDM	SCP	• LCM
Door lock/unlock command (RF)	LCM	SCP	• DDM
Engine coolant temperature	PCM	HS-CAN	• IC
Engine coolant temperature (gateway)	IC	SCP	• HVAC module
Engine coolant temperature status request	HVAC module	SCP	• IC
Engine fail-safe cooling mode status	PCM	HS-CAN	• IC
Engine fail-safe cooling mode status (gateway)	IC	SCP	• LCM
Engine fail-safe cooling mode status request	LCM	SCP	• IC
Engine Malfunction Indicator Lamp (MIL) request	PCM	HS-CAN	• IC
Engine off timer	PCM	HS-CAN	• IC
Engine RPM	PCM	HS-CAN	• ABS module • VDM

			• IC
Engine torque data	PCM	HS-CAN	• ABS module
Engine torque reduction request	ABS module	HS-CAN	• PCM
English/metric display status request	HVAC module	SCP	• IC
Fuel cap off indicator request	PCM	HS-CAN	• IC
Fuel flow data	PCM	HS-CAN	• IC
Fuel level input status (instant)	IC	HS-CAN	• PCM
Headlamp high beam indicator request	LCM	SCP	• IC
Headlamp high beam indicator status request	IC	SCP	• LCM
Horn command	DDM	SCP	• LCM
Ignition switch position	LCM	SCP	• DDM • IC
Ignition switch position status request	DDM	SCP	• LCM
Illuminated entry command	DDM	SCP	• LCM
Illumination dimmer level	LCM	SCP	• DDM • HVAC module • IC
Illumination dimmer level request	DDM	SCP	• LCM
Illumination dimmer level request	HVAC module	SCP	• LCM
Illumination dimmer level request	IC	SCP	• LCM
Key-in-ignition status	LCM	SCP	• DDM
Key-in-ignition status request	DDM	SCP	• LCM
Keypad illumination status	DDM	SCP	• LCM
Odometer count	PCM	HS-CAN	• VDM • IC
Odometer count (gateway)	IC	SCP	• LCM

Overdrive indicator status	PCM	HS-CAN	• IC
Panic status	DDM	SCP	• LCM
Passive Anti-Theft System (PATS) indicator status	PCM	HS-CAN	• IC
PATS key status request	LCM	SCP	• IC
PATS key status	IC	SCP	• LCM
Perimeter alarm status	DDM	SCP	• LCM
Police dark mode status request	LCM	SCP	• DDM
Police dark mode status	DDM	SCP	• LCM
Safety belt buckle indicator status	IC	SCP	• LCM
Safety belt fastened status	LCM	SCP	• IC
Speed control indicator request	PCM	HS-CAN	• IC
Tire pressure monitoring system state status	DDM	SCP	• IC
Traction control event in progress	ABS module	HS-CAN	• PCM
Traction control disable switch status	ABS module	HS-CAN	• IC
Traction control disable switch status (gateway)	IC	SCP	• LCM
Traction control disable switch status request	LCM	SCP	• IC
Transmission selector (PRNDL) range	PCM	HS-CAN	• IC
Transmission selector (PRNDL) range (gateway)	IC	SCP	• DDM • LCM
Transmission shift in progress	PCM	HS-CAN	• ABS module
Vehicle speed	PCM	HS-CAN	• VDM • IC
Vehicle speed (gateway)	IC	SCP	• DDM • HVAC module • LCM
Vehicle Identification Number (VIN) information	PCM	HS-CAN	

			<ul style="list-style-type: none"> <li>• ABS module</li> <li>• IC</li> </ul>
Wheel speed output (RF, LF, RR, LR)	ABS module	HS-CAN	<ul style="list-style-type: none"> <li>• PCM</li> </ul>
Windshield wiper mode status	LCM	SCP	<ul style="list-style-type: none"> <li>• HVAC module</li> </ul>

### Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.
  - If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

### Visual Inspection Chart

Electrical
<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse(s):           <ul style="list-style-type: none"> <li>◆ 3 (10A) (no communication with PCM)</li> <li>◆ 5 (10A) (no communication with Vehicle Dynamics Module (VDM))</li> <li>◆ 7 (30A) (no communication with PCM)</li> <li>◆ 20 (15A) (no communication with PCM)</li> </ul> </li> <li>• Central Junction Box (CJB) fuse(s):           <ul style="list-style-type: none"> <li>◆ 2 (7.5A) (no communication with Instrument Cluster (IC), Driver Door Module (DDM))</li> <li>◆ 6 (7.5A) (no communication with LCM )</li> <li>◆ 8 (10A) (no communication with HVAC module)</li> <li>◆ 13 (10A) (no communication with VDM , IC )</li> <li>◆ 15 (10A) (no communication with the HVAC module)</li> <li>◆ 16 (20A) (no power to scan tool)</li> <li>◆ 20 (10A) (no communication with ABS module)</li> <li>◆ 22 (10A) (no communication with Restraints Control Module (RCM))</li> <li>◆ 24 (10A) (no communication with PCM)</li> <li>◆ 26 (10A) (no communication with IC )</li> <li>◆ 33 (10A) (no communication with Fire Suppression System Module (FSSM))</li> </ul> </li> <li>• Data Link Connector (DLC)</li> <li>• Wiring, terminals or connectors</li> </ul>

3. Connect the scan tool to the DLC .
  - **NOTE:** Make sure to use the latest scan tool software release.

**NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the Integrated Diagnostic System (IDS) does not communicate with the VCM :

- ◆ Check the VCM connection to the vehicle.
- ◆ Check the scan tool connection to the VCM .
- ◆ GO to Pinpoint Test N , to diagnose No Power To The Scan Tool.

4. Establish a scan tool session.

- **NOTE:** The scan tool first attempts to communicate with the PCM, after establishing communication with the PCM, the scan tool then attempts to communicate with all other modules on the vehicle.

If an IDS session cannot be established with the vehicle, ( IDS may state "No communication can be established with the PCM"):

- ◆ Choose "NO" when the scan tool prompts whether or not to retry communication.
- ◆ Enter either a PCM part number, tear tag or calibration number to identify the vehicle and start a session (the PCM part number and 4-character tear tag are printed on the PCM label).
- ◆ GO to Pinpoint Test A , to diagnose The PCM Does Not Respond To The Scan Tool.

5. Carry out the network test.

- If the network test passes, retrieve and record the continuous memory DTCs and proceed to Step 6.
- If the network test fails, GO to Symptom Chart to diagnose the failed communication network.
- If a module fails to communicate during the network test, GO to Symptom Chart .

6. Retrieve and review the DTCs.

- If the DTCs retrieved are related to the concern, go to DTC Charts. Follow the non-network DTC diagnostics (B-codes, C-codes, P-codes) prior to the network DTC diagnostics (U-codes). For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .
- If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

**NOTE:** Network DTCs (U-codes) are often a result of intermittent concerns such as damaged wiring or low battery voltage occurrences. Additionally, vehicle repair procedures such as module reprogramming will often set network DTCs. Replacing a module to resolve a network DTC is unlikely to resolve the concern. To prevent repeat network DTC concerns, inspect all network wiring, especially connectors. Test the vehicle battery, refer to Section 414-01 .

**NOTE:** DTC U1900 sets in a module that is reporting a communication fault from another module on the data bus. The module that reports the fault is not the problem module.

### Communication Network DTC Chart

DTC	Description	Source	Action
U0073	Control Module Communication Bus A Off	ABS module	The module could not communicate on the network at a point in time. The fault is currently

		Vehicle Dynamics Module (VDM)	not present. CLEAR the DTC. REPEAT the network test with the scan tool.
U0100	Lost Communication With ECM /PCM	ABS module VDM	CLEAR the DTC. REPEAT the network test with the scan tool. If the DTC returns, <u>GO to Pinpoint Test A</u> .
U0155	Lost Communication With Instrument Panel Cluster ( IC ) Control Module	VDM	CLEAR the DTC. REPEAT the network test with the scan tool. If the DTC returns, <u>GO to Pinpoint Test C</u> .
U1041	SCP (J1850) Invalid or Missing Data for Vehicle Speed	Driver Door Module (DDM) Lighting Control Module (LCM)	RETRIEVE and FOLLOW non-network DTCs in the PCM.
U1059	SCP (J1850) Invalid or Missing Data for Transmission / Transaxle / PRNDL	DDM LCM	RETRIEVE and FOLLOW non-network DTCs in the PCM.
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant	HVAC module	RETRIEVE and FOLLOW non-network DTCs in the PCM.
U1135	SCP (J1850) Invalid or Missing Data for Ignition Switch / Starter	DDM	RETRIEVE and FOLLOW non-network DTCs in the LCM .
U1197	SCP (J1850) Invalid or Missing Data for Door Locks	LCM	RETRIEVE and FOLLOW non-network DTCs in the DDM .
U1199	SCP (J1850) Invalid or Missing Data for External Access (Doors)	LCM	RETRIEVE and FOLLOW non-network DTCs in the DDM .
U1262	SCP Communication Bus Fault	Instrument Cluster (IC)	For the module that failed the network test, GO to <u>Symptom Chart</u> .
U1900	CAN Communication Bus Fault - Receive Error	Fire Suppression System Module (FSSM) IC	For the module that failed the network test, GO to <u>Symptom Chart</u> .
U2011	Module Transmitted Invalid Data (Non SCP )	VDM	Invalid air suspension operating state data was transmitted. RETRIEVE and FOLLOW non-network DTCs in the DDM .
U2023	Fault Received From External Node	IC	RETRIEVE and FOLLOW non-network DTCs from other modules.

## Symptom Chart

Symptom Chart

## Pinpoint Tests



**Pinpoint Test A: The PCM Does Not Respond To The Scan Tool**

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell 24 , Electronic Engine Controls, 4.6L for schematic and connector information.

**Normal Operation**

The PCM communicates with the scan tool through the High Speed Controller Area Network (HS-CAN).

**This pinpoint test is intended to diagnose the following:**

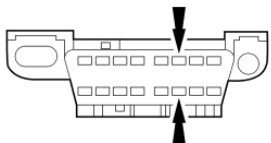
- Fuse
- Wiring, terminals or connectors
- PCM

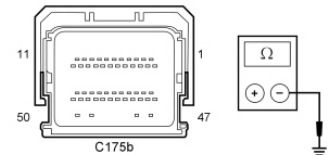
**PINPOINT TEST A: THE PCM DOES NOT RESPOND TO THE SCAN TOOL**

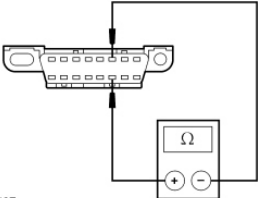
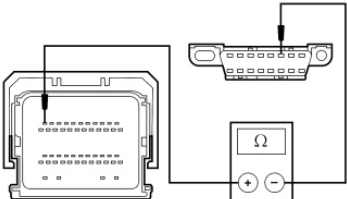
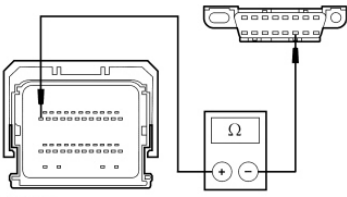
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

Test Step	Result / Action to Take
<b>A1 CHECK THE DLC PINS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>• Inspect the DLC pins 6 and 14 for damage.</li> </ul>  <p>A0093867</p> <ul style="list-style-type: none"> <li>• Are DLC pins 6 and 14 OK?</li> </ul>	<p><b>Yes</b> GO to <u>A2</u> .</p> <p><b>No</b> REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>A2 VERIFY WHETHER OTHER HS-CAN MODULES PASS THE NETWORK TEST</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> </ul>	<p><b>Yes</b> If "pass" or a DTC was listed next to the PCM, a network fault is not</p>

<ul style="list-style-type: none"> <li>• In the LH pane of the Integrated Diagnostic System (IDS) network test display screen, verify whether any HS-CAN modules passed the network test.</li> <li>• <b>Is the text "pass" or a DTC listed next to the ABS module, Instrument Cluster (IC), PCM or Vehicle Dynamics Module (VDM)?</b></li> </ul>	<p>currently present. <b>GO to Pinpoint Test J</b> to diagnose an intermittent HS-CAN fault condition.</p> <p>If "pass" or a DTC was listed next to one or more modules other than the PCM, GO to <b>A3</b>.</p> <p><b>No</b> No modules are currently communicating on the HS-CAN. <b>GO to Pinpoint Test K</b> to diagnose no HS-CAN communication.</p>												
<p><b>A3 VERIFY THE POWERTRAIN CONTROL/EMISSIONS DIAGNOSIS (PC/ED) MANUAL PINPOINT TEST QA HAS BEEN CARRIED OUT</b></p>													
<ul style="list-style-type: none"> <li>• Verify that pinpoint test QA has been carried out.</li> <li>• <b>Has pinpoint test QA been carried out?</b></li> </ul>	<p><b>Yes</b> GO to <b>A4</b>.</p> <p><b>No</b> REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual, Section 5, pinpoint test QA to diagnose no communication with the PCM.</p>												
<p><b>A4 CHECK THE PCM GROUND CIRCUITS FOR AN OPEN</b></p>													
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the PCM, harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C175b-10</td><td>57 (BK)</td></tr> <tr> <td>C175b-47</td><td>570 (BK/WH)</td></tr> <tr> <td>C175b-48</td><td>570 (BK/WH)</td></tr> <tr> <td>C175b-49</td><td>570 (BK/WH)</td></tr> <tr> <td>C175b-50</td><td>570 (BK/WH)</td></tr> </tbody> </table>  <p>N0107441</p>	Connector-Pin	Circuit	C175b-10	57 (BK)	C175b-47	570 (BK/WH)	C175b-48	570 (BK/WH)	C175b-49	570 (BK/WH)	C175b-50	570 (BK/WH)	<p><b>Yes</b> CONNECT the PCM. GO to <b>A5</b>.</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the PCM. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
Connector-Pin	Circuit												
C175b-10	57 (BK)												
C175b-47	570 (BK/WH)												
C175b-48	570 (BK/WH)												
C175b-49	570 (BK/WH)												
C175b-50	570 (BK/WH)												

<ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>A5 CHECK THE HS-CAN TERMINATION RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance between 54 and 66 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <a href="#">A7</a>.</p> <p><b>No</b> GO to <a href="#">A6</a>.</p>
<b>A6 CHECK THE HS-CAN CIRCUITS BETWEEN THE PCM AND THE DLC FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the PCM C175b-11, circuit 1827 (WH/LG), harness side and the DLC C251-6, circuit 1827 (WH/LG), harness side.</li> </ul>  <p>N0002560</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the PCM C175b-23, circuit 1828 (PK/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0002561</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <a href="#">A7</a>.</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the PCM. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>A7 CHECK FOR CORRECT PCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <a href="#">Section 303-14</a>. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b></p>

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul> | The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. |
|--|--|

**Pinpoint Test B: The ABS Module Does Not Respond To The Scan Tool**

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell 42 , Vehicle Dynamic Systems for schematic and connector information.

**Normal Operation**

The ABS module communicates with the scan tool through the High Speed Controller Area Network (HS-CAN).

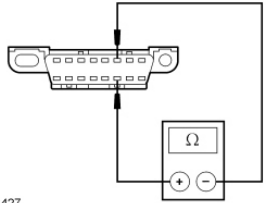
**This pinpoint test is intended to diagnose the following:**

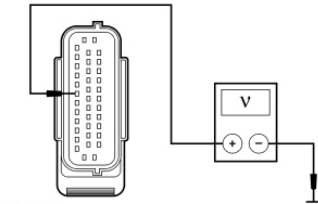
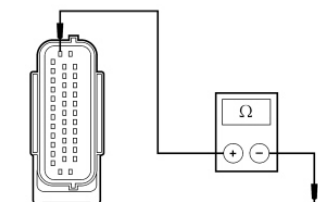
- Fuse
- Wiring, terminals or connectors
- ABS module

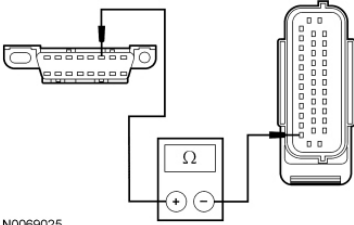
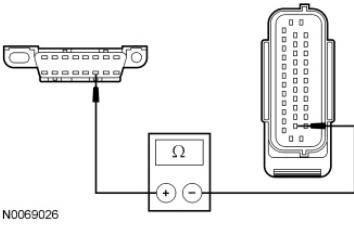
**PINPOINT TEST B: THE ABS MODULE DOES NOT RESPOND TO THE SCAN TOOL**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>B1 CHECK THE HS-CAN TERMINATION RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p>	<p><b>Yes</b> GO to <u>B2</u> .</p> <p><b>No</b> GO to <u>B4</u> .</p>

<ul style="list-style-type: none"> <li>• Is the resistance between 54 and 66 ohms?</li> </ul>	
<b>B2 CHECK THE ABS MODULE VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: ABS Module C135.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the ABS module C135-32, circuit 1789 (VT/WH), harness side and ground.</li> </ul>  <p>N0012677</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <b>B3</b>.</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 20 (10A) is OK. If OK, REPAIR the circuit in question. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. CONNECT the ABS module. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>B3 CHECK THE ABS MODULE GROUND CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the ABS module C135-38, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0012678</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>B4</b>.</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the ABS module. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>B4 CHECK THE HS-CAN CIRCUITS BETWEEN THE DLC AND THE ABS MODULE FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the ABS module C135-26, circuit 1827 (WH/LG), harness side and the Data Link Connector (DLC) C251-6, circuit 1827 (WH/LG), harness side.</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <b>B5</b>.</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the ABS module. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

 <p>N0069025</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the ABS module C135-14, circuit 1828 (PK/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>	
 <p>N0069026</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>B5 CHECK FOR CORRECT ABS MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the ABS module connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the ABS module connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b>  <b>INSTALL</b> a new ABS module. REFER to <u>Section 206-09</u> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b>  The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test C: The Instrument Cluster (IC) Does Not Respond To The Scan Tool

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

#### Normal Operation

The Instrument Cluster (IC) communicates with the scan tool through the High Speed Controller Area Network (HS-CAN).

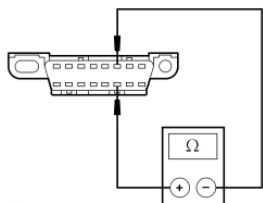
**This pinpoint test is intended to diagnose the following:**

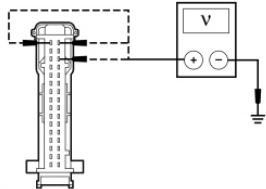
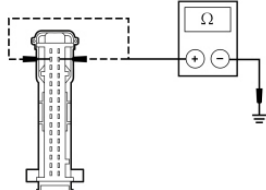
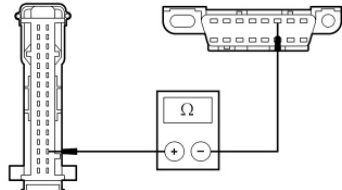
- Fuse
- Wiring, terminals or connectors
- IC

**PINPOINT TEST C: THE IC DOES NOT RESPOND TO THE SCAN TOOL**

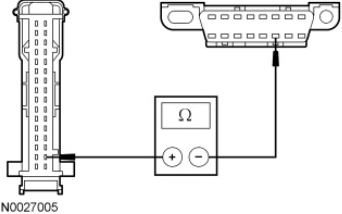
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take								
<b>C1 CHECK THE HS-CAN TERMINATION RESISTANCE</b>									
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Disconnect: Negative Battery Cable.</li> <li>Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>Is the resistance between 54 and 66 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>C2</u> .</p> <p><b>No</b> GO to <u>C4</u> .</p>								
<b>C2 CHECK THE IC VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</b>									
<ul style="list-style-type: none"> <li>Disconnect: IC C2220.</li> <li>Ignition ON.</li> <li>Measure the voltage between the IC , harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C2220-1</td><td>1523 (DG)</td></tr> <tr> <td>C2220-17</td><td>1003 (GY/YE)</td></tr> <tr> <td>C2220-19</td><td>640 (RD/YE)</td></tr> </tbody> </table>	Connector-Pin	Circuit	C2220-1	1523 (DG)	C2220-17	1003 (GY/YE)	C2220-19	640 (RD/YE)	<p><b>Yes</b> GO to <u>C3</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuses 2 (7.5A), 13 (10A) and 26 (10A) are OK. If OK, REPAIR the circuit in question. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
Connector-Pin	Circuit								
C2220-1	1523 (DG)								
C2220-17	1003 (GY/YE)								
C2220-19	640 (RD/YE)								

 <p>N0107442</p> <ul style="list-style-type: none"> <li>• Are the voltages greater than 10 volts?</li> </ul>							
<b>C3 CHECK THE IC GROUND CIRCUITS FOR AN OPEN</b>							
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the IC , harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C2220-2</td><td>676 (PK/OG)</td></tr> <tr> <td>C2220-18</td><td>57 (BK)</td></tr> </tbody> </table>  <p>N0107443</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	Connector-Pin	Circuit	C2220-2	676 (PK/OG)	C2220-18	57 (BK)	<p><b>Yes</b> GO to <u>C4</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
Connector-Pin	Circuit						
C2220-2	676 (PK/OG)						
C2220-18	57 (BK)						
<b>C4 CHECK THE HS-CAN CIRCUITS BETWEEN THE IC AND THE DLC FOR AN OPEN</b>							
<ul style="list-style-type: none"> <li>• Disconnect: IC C2220.</li> <li>• Measure the resistance between the IC C2220-30, circuit 1827 (WH/LG), harness side and the DLC C251-6, circuit 1827 (WH/LG), harness side.</li> </ul>  <p>N0027004</p>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>C5</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>						



<ul style="list-style-type: none"> <li>• Measure the resistance between the IC C2220-31, circuit 1828 (PK/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0027005</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>C5 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b>            INSTALL a new IC . REFER to <a href="#">Section 413-01</a> .            CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b>            The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test D: The Vehicle Dynamics Module (VDM) Does Not Respond To The Scan Tool

Refer to Wiring Diagrams Cell [14](#) , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell [41](#) , Vehicle Dynamic Suspension for schematic and connector information.

#### Normal Operation

The Vehicle Dynamics Module (VDM) (if equipped) communicates with the scan tool through the High Speed Controller Area Network (HS-CAN).

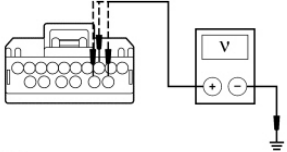
**This pinpoint test is intended to diagnose the following:**

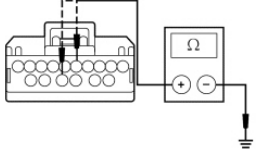
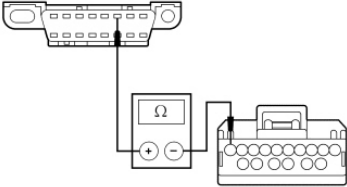
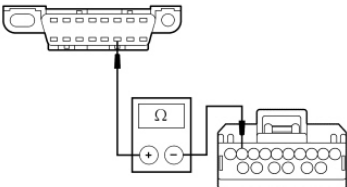
- Fuse
- Wiring, terminals or connectors
- VDM

#### PINPOINT TEST D: THE VDM DOES NOT RESPOND TO THE SCAN TOOL

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take								
<b>D1 CHECK THE VDM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</b>									
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: VDM C2131a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the VDM , harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C2131a-11</td><td>418 (DG/YE)</td></tr> <tr> <td>C2131a-12</td><td>418 (DG/YE)</td></tr> <tr> <td>C2131a-3</td><td>1003 (GY/YE)</td></tr> </tbody> </table>  <p>N0090654</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages greater than 10 volts?</b></li> </ul>	Connector-Pin	Circuit	C2131a-11	418 (DG/YE)	C2131a-12	418 (DG/YE)	C2131a-3	1003 (GY/YE)	<p><b>Yes</b> GO to <u>D2</u> .</p> <p><b>No</b> VERIFY the Battery Junction Box (BJB) fuse 5 (10A) and the Central Junction Box (CJB) fuse 13 (10A) are OK. If OK, REPAIR the circuit in question. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
Connector-Pin	Circuit								
C2131a-11	418 (DG/YE)								
C2131a-12	418 (DG/YE)								
C2131a-3	1003 (GY/YE)								
<b>D2 CHECK THE VDM GROUND CIRCUITS FOR AN OPEN</b>									
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Disconnect: VDM C2131b.</li> <li>• Measure the resistance between the VDM , harness side and ground as follows:</li> </ul> <table border="1"> <thead> <tr> <th>Connector-Pin</th><th>Circuit</th></tr> </thead> <tbody> <tr> <td>C2131a-5</td><td>57 (BK)</td></tr> <tr> <td>C2131a-14</td><td>57 (BK)</td></tr> </tbody> </table>	Connector-Pin	Circuit	C2131a-5	57 (BK)	C2131a-14	57 (BK)	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>		
Connector-Pin	Circuit								
C2131a-5	57 (BK)								
C2131a-14	57 (BK)								

 <p>N0090655</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<p><b>D3 CHECK THE HS-CAN CIRCUITS BETWEEN THE DLC AND THE VDM FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the Data Link Connector (DLC) C251-6, circuit 1827 (WH/LG), harness side and the VDM C2131a-10, circuit 1827 (WH/LG), harness side.</li> </ul>  <p>N0053584</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-14, circuit 1828 (PK/LG) harness side and the VDM C2131a-9, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0053585</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>D4</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>D4 CHECK FOR CORRECT VDM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all the VDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the VDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new VDM . REFER to <u>Section 204-05</u> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test E: The HVAC Module Does Not Respond To The Scan Tool**

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell 55 , Automatic Climate Control System for schematic and connector information.

**Normal Operation**

The HVAC module (if equipped) communicates with the scan tool through the Standard Corporate Protocol (SCP) communication network.

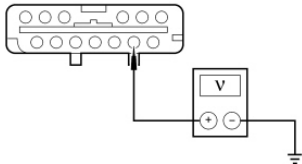
**This pinpoint test is intended to diagnose the following:**

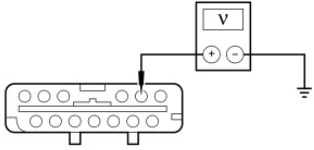
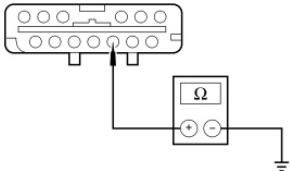
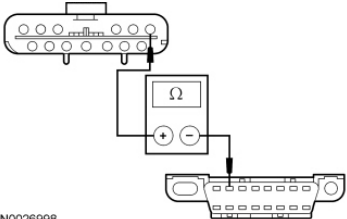
- Fuse
- Wiring, terminals or connectors
- HVAC module

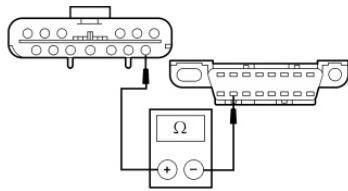
**PINPOINT TEST E: THE HVAC MODULE DOES NOT RESPOND TO THE SCAN TOOL**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>E1 CHECK THE HVAC MODULE VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the HVAC module C228a-2, circuit 1566 (RD/YE), harness side and ground.</li> </ul>  <p>A0041331</p> <ul style="list-style-type: none"> <li>• Measure the voltage between the HVAC module C228a-16, circuit 1812 (BN/WH), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuses 8 (10A) and 15 (10A) are OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

 <p>A0041332</p> <ul style="list-style-type: none"> <li>• <b>Are the voltages greater than 10 volts?</b></li> </ul>	
<b>E2 CHECK THE HVAC MODULE GROUND CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the HVAC module C228a-3, circuit 57 (BK), harness side and ground.</li> </ul>  <p>A0041330</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>E3</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>E3 CHECK THE SCP CIRCUITS BETWEEN THE HVAC MODULE AND THE DLC FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the HVAC module C228a-15, circuit 914 (TN/OG), harness side and the Data Link Connector (DLC) C251-2, circuit 914 (TN/OG), harness side.</li> </ul>  <p>N0026998</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the HVAC module C228a-1, circuit 915 (PK/LB), harness side and the DLC C251-10, circuit 915 (PK/LB), harness side.</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>E4</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>



- Are the resistances less than 5 ohms?

#### E4 CHECK FOR CORRECT HVAC MODULE OPERATION

- Disconnect all the HVAC module connectors.
- Check for:
  - ◆ corrosion
  - ◆ damaged pins
  - ◆ pushed-out pins
- Connect all the HVAC module connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- Is the concern still present?

#### Yes

INSTALL a new HVAC module. REFER to [Section 412-01](#) . CLEAR the DTCs. REPEAT the network test with the scan tool.

#### No

The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

### Pinpoint Test F: The Lighting Control Module (LCM) Does Not Respond To The Scan Tool

Refer to Wiring Diagrams Cell [14](#) , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell [58](#) , Lighting Control Module for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) communicates with the scan tool through the Standard Corporate Protocol (SCP) communication network.

This pinpoint test is intended to diagnose the following:

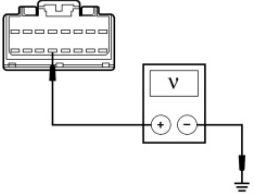
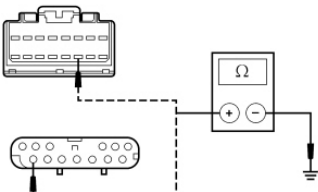
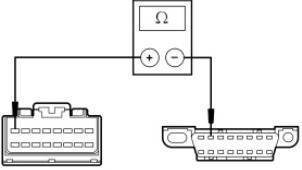
- Fuse
- Wiring, terminals or connectors
- LCM

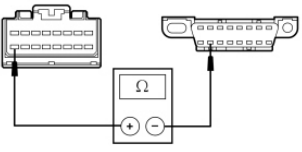
#### PINPOINT TEST F: THE LCM DOES NOT RESPOND TO THE SCAN TOOL

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
<b>F1 CHECK THE LCM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the LCM C2145a-13, circuit 221 (OG/WH), harness side and ground.</li> </ul>  <p>N0026949</p> <p>• Is the voltage greater than 10 volts?</p>	<p><b>Yes</b> GO to <b>F2</b> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 6 (7.5A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>F2 CHECK THE LCM GROUND CIRCUITS FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Measure the resistance between the LCM C2145a-11, circuit 676 (PK/OG), harness side and ground; and between the C2145c-7, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0012453</p> <p>• Are the resistances less than 5 ohms?</p>	<p><b>Yes</b> GO to <b>F3</b> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>F3 CHECK THE SCP CIRCUITS BETWEEN THE LCM AND THE DLC FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the LCM C2145a-8, circuit 914 (TN/OG), harness side and the Data Link Connector (DLC) C251-2, circuit 914 (TN/OG), harness side.</li> </ul>  <p>N0107444</p>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <b>F4</b> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

<ul style="list-style-type: none"> <li>• Measure the resistance between the LCM C2145a-16, circuit 915 (PK/LB), harness side and the DLC C251-10, circuit 915 (PK/LB), harness side.</li> </ul>  <p>N0107445</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	
<b>F4 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test G: The Driver Door Module (DDM) Does Not Respond To The Scan Tool**

Refer to Wiring Diagrams Cell [14](#) , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell [117](#) , Remote Keyless Entry and Alarm for schematic and connector information.

**Normal Operation**

The Driver Door Module (DDM) (if equipped) communicates with the scan tool through the Standard Corporate Protocol (SCP) communication network.

**This pinpoint test is intended to diagnose the following:**

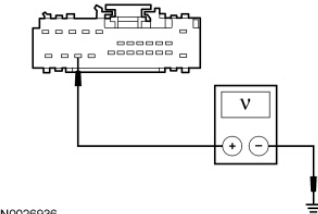
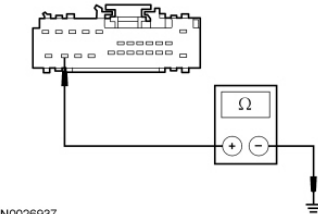
- Fuse
- Wiring, terminals or connectors
- DDM

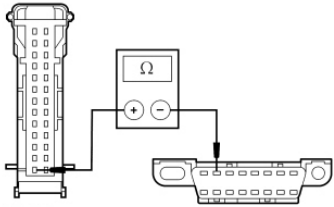
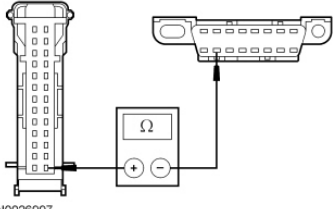
**PINPOINT TEST G: THE DDM DOES NOT RESPOND TO THE SCAN TOOL**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.



**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>G1 CHECK THE DDM VOLTAGE SUPPLY CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: DDM C501b.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the DDM C501b-22, circuit 1523 (DG), harness side and ground.</li> </ul>  <p>N0026936</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>G2</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 2 (7.5A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>G2 CHECK THE DDM GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the DDM C501b-23, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0026937</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>G3</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>G3 CHECK THE SCP CIRCUITS BETWEEN THE DDM AND THE DLC FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: DDM C501a.</li> <li>• Measure the resistance between the Driver Door Module (DDM) C501a-1, circuit 914 (TN/OG), harness side and the DLC C251-2, circuit 914 (TN/OG), harness side.</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>G4</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

 <p>N0026996</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the DDM C501a-14, circuit 915 (PK/LB), harness side and the DLC C251-10, circuit 915 (PK/LB), harness side.</li> </ul>	
 <p>N0026997</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>G4 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test H: The Fire Suppression System Module (FSSM) Does Not Respond To The Scan Tool

Refer to Wiring Diagrams Cell [14](#) , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell [26](#) , Police Option for schematic and connector information.

#### Normal Operation

The Fire Suppression System Module (FSSM) (if equipped) communicates with the scan tool through the ISO 9141 communication network. The FSSM also communicates with the PCM via the High Speed Controller Area Network (HS-CAN).

**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- FSSM

**PINPOINT TEST H: THE FSSM DOES NOT RESPOND TO THE SCAN TOOL**

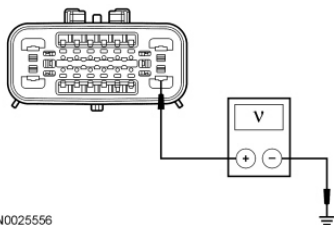
**⚠ WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **Section 100-02B** . Failure to follow the instructions may result in serious personal injury.

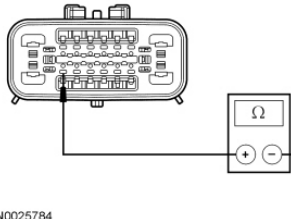
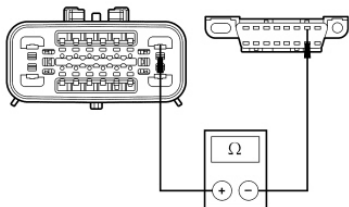
**⚠ WARNING:** If equipped with fire suppression system, refer to **Section 100-02B** for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

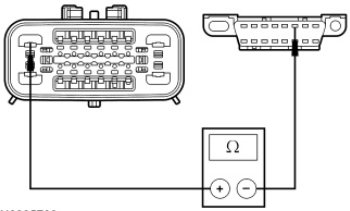
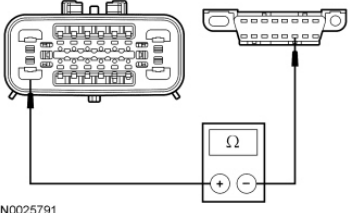
**⚠ WARNING:** To reduce the risk of accidental deployment, do not use any memory saver devices when depowering the fire suppression system. Failure to follow this instruction may result in serious personal injury.

**⚠ WARNING:** To reduce the risk of accidental deployment, never probe the connectors on the fire suppressors. Failure to follow this instruction may cause unintentional deployment of the suppressors, which may result in serious personal injury.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to **Section 414-01** .

Test Step	Result / Action to Take
<b>H1 CHECK THE FSSM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait approximately 60 seconds to allow the FSSM back-up power supply to discharge.</li> <li>• Disconnect: FSSM C3281a.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the FSSM C3281a-1, circuit 2319 (RD/YE), harness side and ground.</li> </ul>  <p>N0025556</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <b>H2</b> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 33 (10A) is OK. If OK, DISCONNECT the battery. REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. CONNECT the FSSM . CONNECT the battery. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>H2 CHECK THE FSSM CASE GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the FSSM case and the battery cable</li> </ul>	<p><b>Yes</b> GO to <b>H3</b> .</p> <p><b>No</b> REPAIR the ground connection to the FSSM case.</p>

<p>ground terminal.</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p>CONNECT the FSSM . CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>H3 CHECK THE GROUND CIRCUIT</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-7, circuit 1203 (BK/LB), harness side and ground.</li> </ul>  <p>N0025784</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>H4</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the FSSM C3281a. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>H4 CHECK CIRCUIT 70 (LB/WH) BETWEEN THE DLC AND THE FSSM FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-9, circuit 70 (LB/WH), harness side and the Data Link Connector (DLC) C251-7, circuit 70 (LB/WH), harness side.</li> </ul>  <p>N0025792</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>H5</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the FSSM C3281a. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>H5 CHECK THE HS-CAN CIRCUITS BETWEEN THE FSSM AND THE DLC FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-16, circuit 1827 (WH/LG), harness side and the DLC C251-6, circuit 1827 (WH/LG), harness side.</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>H6</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the FSSM C3281a. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

 <p>N0025790</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the FSSM C3281a-8, circuit 1828 (PK/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0025791</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<b>H6 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b>            INSTALL a new FSSM . REFER to <u>Section 100-02B</u> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b>            The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test I: The Restraints Control Module (RCM) Does Not Respond To The Scan Tool

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell 46 , Supplemental Restraint System for schematic and connector information.

#### Normal Operation

The Restraints Control Module (RCM) communicates with the scan tool through the ISO 9141 communication network.

**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors

- RCM

**PINPOINT TEST I: THE RCM DOES NOT RESPOND TO THE SCAN TOOL**

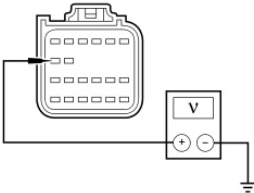
**⚠ WARNING:** Never disassemble or tamper with safety belt buckle/retractor pretensioners or adaptive load limiting retractors or probe the electrical connectors. Failure to follow this instruction may result in the accidental deployment of the safety belt pretensioners or adaptive load limiting retractors which increases the risk of serious personal injury or death.

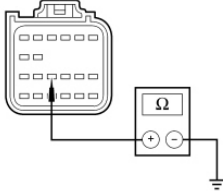
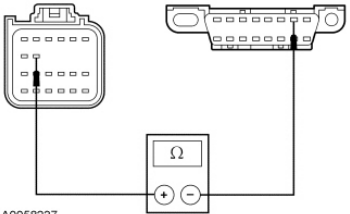
**⚠ WARNING:** Never probe the electrical connectors on air bag, Safety Canopy® or side air curtain modules. Failure to follow this instruction may result in the accidental deployment of these modules, which increases the risk of serious personal injury or death.

**NOTE:** The Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>I1 CHECK THE RCM VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Deactivate the SRS . Refer to <u>Section 501-20B</u> .</li> <li>• Disconnect: RCM C310a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the RCM C310a-12, circuit 937 (RD/WH), harness side and ground.</li> </ul>  <p>A0039638</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>I2</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 22 (10A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. REACTIVATE the SRS . REFER to <u>Section 501-20B</u> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>I2 CHECK THE RCM GROUND CIRCUIT</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the RCM C310a-16, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>A0039639</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 0.5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>I3</b> .</p> <p><b>No</b> REPAIR the circuit. REACTIVATE the SRS . REFER to <a href="#">Section 501-20B</a> . CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>I3 CHECK CIRCUIT 70 (LB/WH) BETWEEN THE RCM AND THE DLC FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the RCM C310a-11, circuit 70 (LB/WH), harness side and the DLC C251-7, circuit 70 (LB/WH), harness side.</li> </ul>  <p>A0058237</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <b>I4</b> .</p> <p><b>No</b> REPAIR the circuit. REACTIVATE the SRS . REFER to <a href="#">Section 501-20B</a> . CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>I4 CHECK FOR CORRECT RCM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all the RCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>♦ corrosion</li> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> </ul> </li> <li>• Connect all the RCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new RCM . REACTIVATE the SRS . REFER to <a href="#">Section 501-20B</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. REACTIVATE the SRS . REFER to <a href="#">Section 501-20B</a> .</p>

**Pinpoint Test J: Intermittent No High Speed Controller Area Network (HS-CAN) Communication, One Or More Modules Are Not Responding During Network Test**

**Normal Operation**

An open circuit ( HS-CAN +) or ( HS-CAN -) may cause intermittent or unreliable communication to all modules on the High Speed Controller Area Network (HS-CAN). In the event that 1 of the 2 network circuits ( HS-CAN + or HS-CAN -) becomes open to a module on the network, unreliable network communication to all modules on the network may result.

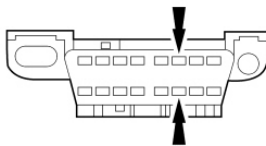
**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors

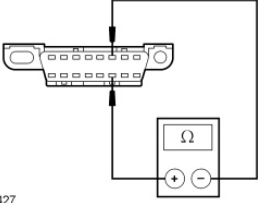
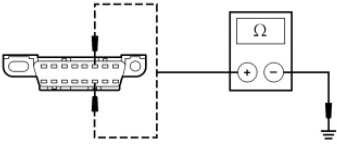
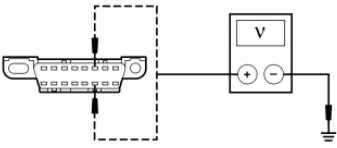
**PINPOINT TEST J: INTERMITTENT NO HS-CAN COMMUNICATION, ONE OR MORE MODULES ARE NOT RESPONDING DURING NETWORK TEST**

**NOTE:** Various modules set network DTCs during this test procedure. Clear DTCs from all modules after the diagnostic procedure is completed.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>J1 CHECK THE DLC PINS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• Select DRIVE.</li> <li>• Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>• Inspect DLC pins 6 and 14 for damage.</li> </ul>  <p>A0093867</p> <ul style="list-style-type: none"> <li>• Are DLC pins 6 and 14 OK?</li> </ul>	<p><b>Yes</b> GO to <u>J2</u> .</p> <p><b>No</b> REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>J2 CHECK THE HS-CAN TERMINATION RESISTANCE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>J3</u> .</p> <p><b>No</b> <u>GO to Pinpoint Test A</u> .</p>



 <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance between 54 and 132 ohms?</li> </ul>	
<p><b>J3 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 1,000 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>J4</u> .</p> <p><b>No</b> GO to Pinpoint Test A .</p>
<p><b>J4 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002964</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 6 volts?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> GO to <u>J5</u> .</p>
<p><b>J5 CHECK FOR RESTORED COMMUNICATION WITH THE PCM DISABLED</b></p>	
<p><b>NOTE:</b> An Integrated Diagnostic System (IDS) session must be established prior to disabling the PCM in this test step. If the PCM has failed communication during multiple attempts to identify the vehicle, first identify the vehicle manually by entering a PCM part number, calibration number or tear tag when prompted by IDS .</p> <p><b>NOTE:</b> When a vehicle is manually identified by a PCM part number, calibration number or tear tag, the IDS does not automatically run a network test. The network test must be manually</p>	<p><b>Yes</b> INSTALL the removed fuses. GO to Pinpoint Test A .</p> <p><b>No</b> INSTALL the removed fuses. GO to <u>J6</u> .</p>

<p>selected and run.</p> <ul style="list-style-type: none"> <li>• Disconnect: Battery Junction Box (BJB) Fuses 3 (10A), 7 (30A) and 20 (15A).</li> <li>• Disconnect: Network Test.</li> <li>• Repeat the network test.</li> <li>• <b>Do all other modules pass the network test?</b></li> </ul>	
<b>J6 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE ABS MODULE DISABLED</b>	
<p><b>NOTE:</b> When re-running the network test, the network test application must be first closed or the screen display reverts back to the prior run network test results.</p> <ul style="list-style-type: none"> <li>• Disconnect: Central Junction Box (CJB) Fuse 20 (10A).</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Repeat the network test.</li> <li>• <b>Do all other modules pass the network test?</b></li> </ul>	<p><b>Yes</b> INSTALL the removed fuse. <u>GO to Pinpoint Test B</u> .</p> <p><b>No</b> INSTALL the removed fuse. GO to <u>J7</u> .</p>
<b>J7 VERIFY VEHICLE EQUIPMENT â VDM</b>	
<ul style="list-style-type: none"> <li>• Inspect the vehicle for a Vehicle Dynamics Module (VDM).</li> <li>• <b>Is the vehicle equipped with a VDM ?</b></li> </ul>	<p><b>Yes</b> GO to <u>J8</u> .</p> <p><b>No</b> GO to <u>J9</u> .</p>
<b>J8 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE VDM DISABLED</b>	
<p><b>NOTE:</b> When re-running the network test, the network test application must be first closed or the screen display reverts back to the prior run network test results.</p> <ul style="list-style-type: none"> <li>• Disconnect: BJB Fuse 5 (10A) and CJB Fuse 13 (10A).</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Repeat the network test.</li> <li>• <b>Do all other modules pass the network test?</b></li> </ul>	<p><b>Yes</b> INSTALL the removed fuses. <u>GO to Pinpoint Test F</u> .</p> <p><b>No</b> INSTALL the removed fuses. GO to <u>J9</u> .</p>
<b>J9 VERIFY VEHICLE EQUIPMENT â FSSM</b>	
<ul style="list-style-type: none"> <li>• Some police vehicles are equipped with an Fire Suppression System Module (FSSM). Inspect the vehicle for an FSSM .</li> <li>• <b>Is the vehicle equipped with an FSSM ?</b></li> </ul>	<p><b>Yes</b> GO to <u>J10</u> .</p> <p><b>No</b> GO to <u>J11</u> .</p>
<b>J10 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE FSSM DISABLED</b>	
<p><b>NOTE:</b> When re-running the network test, the network test application must be first closed or the screen display reverts back to the prior run network test results.</p> <ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 33 (10A).</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Repeat the network test.</li> <li>• <b>Do all other modules pass the network test?</b></li> </ul>	<p><b>Yes</b> INSTALL the removed fuse. <u>GO to Pinpoint Test J</u> .</p> <p><b>No</b> INSTALL the removed fuse. GO to <u>J11</u> .</p>

<b>J11 CHECK FOR RESTORED NETWORK COMMUNICATION WITH THE IC DISABLED</b>	
<p><b>NOTE:</b> When re-running the network test, the network test application must be first closed or the screen display reverts back to the prior run network test results.</p> <ul style="list-style-type: none"> <li>• Disconnect: CJB Fuse 2 (7.5A), 13 (10A) and 26 (10A).</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Repeat the network test.</li> <li>• <b>Do all other modules pass the network test?</b></li> </ul>	<p><b>Yes</b> INSTALL the removed fuses. <u>GO to Pinpoint Test C</u> .</p> <p><b>No</b> INSTALL the removed fuses. An intermittent fault is not present. <u>GO to Pinpoint Test A</u> .</p>

### **Pinpoint Test K: No High Speed Controller Area Network (HS-CAN) Communication, All Modules Are Not Responding**

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

Refer to Wiring Diagrams Cell 24 , Electronic Engine Controls, 4.6L for schematic and connector information.

#### **Normal Operation**

The High Speed Controller Area Network (HS-CAN) uses an unshielded twisted pair cable, circuits ( HS-CAN +) and ( HS-CAN -).

**This pinpoint test is intended to diagnose the following:**

- Fuse
- Wiring, terminals or connectors
- ABS module
- Fire Suppression System Module (FSSM) (if equipped)
- Instrument Cluster (IC)
- Vehicle Dynamics Module (VDM) (if equipped)
- PCM

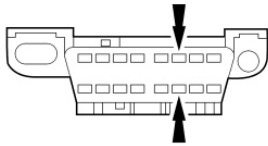
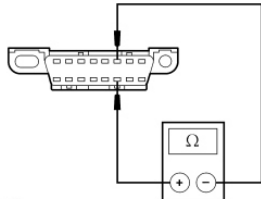
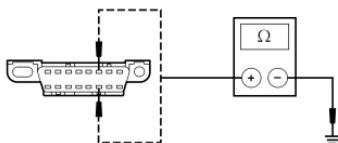
#### **PINPOINT TEST K: NO HS-CAN COMMUNICATION, ALL MODULES ARE NOT RESPONDING**

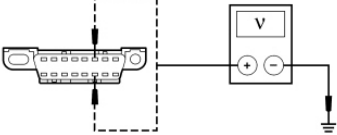
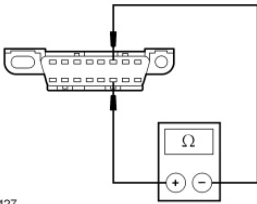
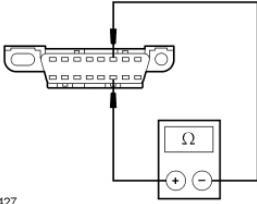
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

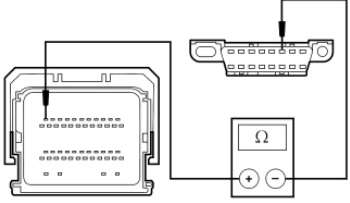
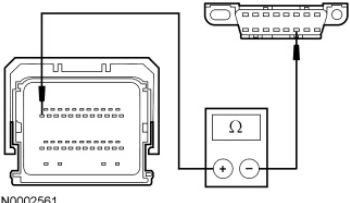
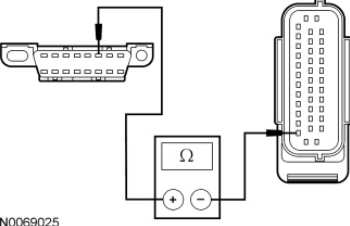
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

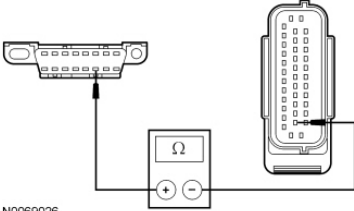
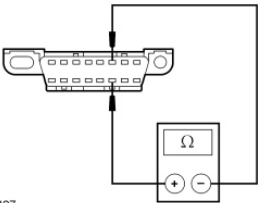
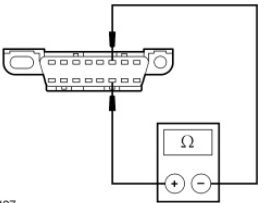
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

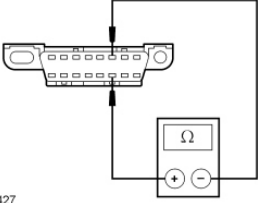
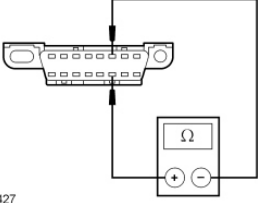
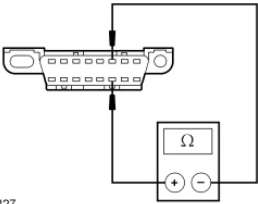
<b>Test Step</b>	<b>Result / Action to Take</b>
<b>K1 CHECK THE DLC PINS FOR DAMAGE</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>• Inspect the DLC pins 6 and 14 for damage.</li> </ul>  <p>A0093867</p> <p>• Are DLC pins 6 and 14 OK?</p>	<p><b>Yes</b> GO to <b>K2</b> .</p> <p><b>No</b> REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>K2 CHECK THE HS-CAN TERMINATION RESISTANCE</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <p>• Is the resistance between 54 and 66 ohms?</p>	<p><b>Yes</b> GO to <b>K3</b> .</p> <p><b>No</b> GO to <b>K5</b> .</p>
<p><b>K3 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p> <p>• Are the resistances greater than 1,000 ohms?</p>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <b>K4</b> .</p> <p><b>No</b> GO to <b>K16</b> .</p>
<p><b>K4 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO VOLTAGE</b></p>	

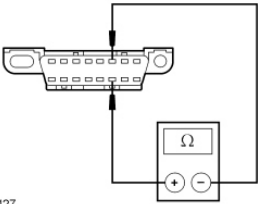
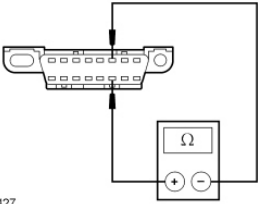
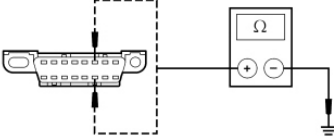
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002964</p> <ul style="list-style-type: none"> <li>• Are the voltages greater than 6 volts?</li> </ul>	<p><b>Yes</b> REPAIR the circuit in question. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> GO to Pinpoint Test J to diagnose an intermittent HS-CAN fault condition.</p>
<p><b>K5 CHECK THE HS-CAN TERMINATION RESISTOR</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance between 108 and 132 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K6</u> .</p> <p><b>No</b> GO to <u>K9</u> .</p>
<p><b>K6 CHECK THE HS-CAN TERMINATION RESISTOR WITH THE PCM DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: PCM C175b.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance between 108 and 132 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K7</u> .</p> <p><b>No</b> GO to <u>K8</u> .</p>
<p><b>K7 CHECK THE HS-CAN CIRCUITS BETWEEN THE PCM AND THE DLC FOR AN OPEN</b></p>	

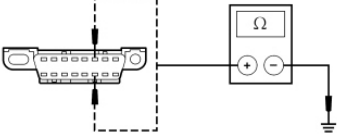
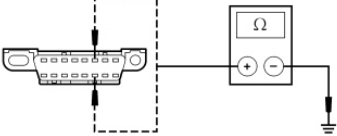
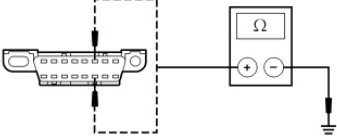
<ul style="list-style-type: none"> <li>• Measure the resistance between the PCM C175b-11, circuit 1827 (WH/LG), harness side and the DLC C251-6, circuit 1827 (WH/LG), harness side.</li> </ul>  <p>N0002560</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the PCM C175b-23, circuit 1828 (PK/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0002561</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <b>K21</b> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CONNECT the PCM. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<p><b>K8 CHECK THE HS-CAN CIRCUITS BETWEEN THE DLC AND THE ABS MODULE FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the Data Link Connector (DLC) C251-6, circuit 1827 (WH/LG), harness side and the ABS module C135-26, circuit 1827 (WH/LG), harness side.</li> </ul>  <p>N0069025</p> <ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-14, circuit 1828 (PK/LG) harness side and the ABS module C135-14, circuit 1828 (PK/LG), harness side.</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <b>K22</b> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

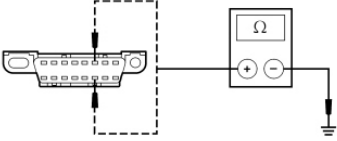
 <p>N0069026</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	
<p><b>K9 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>K11</u> .</p> <p><b>No</b> GO to <u>K10</u> .</p>
<p><b>K10 CHECK THE HS-CAN CIRCUITS FOR AN OPEN AT THE DLC</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> REPAIR the DLC or the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> A capacitor internal to a module may still be draining causing irregular resistance readings. WAIT 5 minutes. REPEAT the pinpoint test.</p>
<p><b>K11 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER WITH THE PCM DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: PCM C175b.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>	<p><b>Yes</b> GO to <u>K12</u> .</p> <p><b>No</b> CONNECT the negative battery cable. GO to <u>K21</u> .</p>

 <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	
<p><b>K12 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER WITH THE ABS MODULE DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: ABS Module C135.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> If the vehicle is equipped with a Fire Suppression System Module (FSSM), GO to <b>K13</b> .</p> <p>If the vehicle is not equipped with an FSSM , GO to <b>K14</b> .</p> <p><b>No</b> CONNECT all modules. CONNECT the negative battery cable. GO to <b>K22</b> .</p>
<p><b>K13 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER WITH THE FSSM DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: FSSM C3281a.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>K14</b> .</p> <p><b>No</b> CONNECT all modules. CONNECT the negative battery cable. GO to <b>K23</b> .</p>
<p><b>K14 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER WITH THE IC DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: IC C2220.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>	<p><b>Yes</b> If the vehicle is equipped with a VDM , GO to <b>K15</b> .</p> <p>If the vehicle is not equipped with a VDM , REPAIR the circuit in question.</p>



 <p>N0026427</p> <p>• Is the resistance less than 5 ohms?</p>	<p>CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> CONNECT all modules. CONNECT the negative battery cable. GO to <a href="#">K24</a> .</p>
<p><b>K15 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TOGETHER WITH THE VDM DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: VDM C2131a.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and the DLC C251-14, circuit 1828 (PK/LG), harness side.</li> </ul>  <p>N0026427</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> REPAIR the circuit in question. CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> CONNECT all modules. CONNECT the negative battery cable. GO to <a href="#">K25</a> .</p>
<p><b>K16 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE PCM DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: PCM C175b.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p> <p>• Are the resistances greater than 1,000 ohms?</p>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <a href="#">K21</a> .</p> <p><b>No</b> GO to <a href="#">K17</a> .</p>
<p><b>K17 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE ABS MODULE DISCONNECTED</b></p>	

<ul style="list-style-type: none"> <li>• Disconnect: ABS Module C135.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 1,000 ohms?</li> </ul>	<p><b>Yes</b> CONNECT all modules. CONNECT the negative battery cable. GO to <b>K22</b> .</p> <p><b>No</b> If the vehicle is equipped with an FSSM , GO to <b>K18</b> .</p> <p>If the vehicle is not equipped with an FSSM , GO to <b>K19</b> .</p>
<p><b>K18 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE FSSM DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: FSSM C3281a (If Equipped).</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 1,000 ohms?</li> </ul>	<p><b>Yes</b> CONNECT all modules. CONNECT the negative battery cable. GO to <b>K23</b> .</p> <p><b>No</b> GO to <b>K19</b> .</p>
<p><b>K19 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE IC DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Instrument Cluster (IC) C2220.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p>	<p><b>Yes</b> CONNECT all modules. CONNECT the negative battery cable. GO to <b>K24</b> .</p> <p><b>No</b> If the vehicle is equipped with a VDM , GO to <b>K20</b> .</p> <p>If the vehicle is not equipped with a VDM , REPAIR the circuit in question. CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

<ul style="list-style-type: none"> <li>• Are the resistances greater than 1,000 ohms?</li> </ul>	
<b>K20 CHECK THE HS-CAN (+) AND HS-CAN (-) CIRCUITS FOR A SHORT TO GROUND WITH THE VDM DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>• Disconnect: VDM C2131a.</li> <li>• Measure the resistance between the DLC C251-6, circuit 1827 (WH/LG), harness side and ground; and between the DLC C251-14, circuit 1828 (PK/LG), harness side and ground.</li> </ul>  <p>N0002963</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 1,000 ohms?</li> </ul>	<p><b>Yes</b> CONNECT all modules. CONNECT the negative battery cable. GO to <b>K25</b> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>K21 CHECK FOR CORRECT PCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <a href="#">Section 303-14</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>K22 CHECK FOR CORRECT ABS MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the ABS module connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the ABS module connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new ABS module. REFER to <a href="#">Section 206-09</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>K23 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <a href="#">Section 100-02B</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p>

<ul style="list-style-type: none"> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>K24 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the IC connector.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the IC connector and make sure it seats correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new IC . REFER to <a href="#">Section 413-01</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>K25 CHECK FOR CORRECT VDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the VDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the VDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new VDM . For air suspension equipped vehicles, REFER to <a href="#">Section 204-05</a> . For non-air suspension equipped vehicles, REFER to <a href="#">Section 211-02</a> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test L: No ISO 9141 Network Communication, All Modules Are Not Responding

Refer to Wiring Diagrams Cell [14](#) , Module Communications Network for schematic and connector information.

#### Normal Operation

The ISO 9141 network has an unshielded single wire. The ISO 9141 network does not permit intermodule communication between the Data Link Connector (DLC) and the network modules.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- FSSM
- RCM

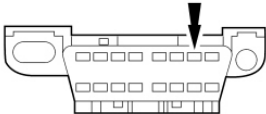
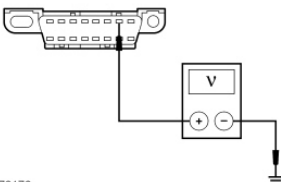
**PINPOINT TEST L: NO ISO 9141 NETWORK COMMUNICATION, ALL MODULES ARE NOT RESPONDING**

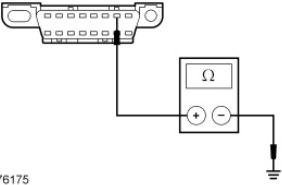
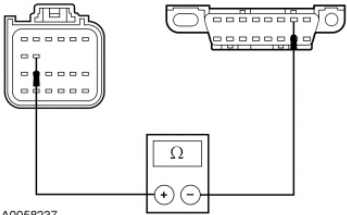
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** The supplemental Supplemental Restraint System (SRS) must be fully operational and free of faults before releasing the vehicle to the customer.

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>L1 CHECK DLC PINS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>• Inspect the DLC pin 7 for damage.</li> </ul>  <p>N0053184</p> <ul style="list-style-type: none"> <li>• Is the DLC pin 7 OK?</li> </ul>	<p><b>Yes</b> GO to <u>L2</u> .</p> <p><b>No</b> REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>L2 CHECK THE ISO 9141 CIRCUIT FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Wait at least 1 minute.</li> <li>• Disconnect: RCM C310a.</li> <li>• Disconnect: FSSM C3281a (If Equipped).</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the DLC C251-7, circuit 70 (LB/WH), harness side and ground.</li> </ul>  <p>A0076176</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	<p><b>Yes</b> REPAIR the circuit. CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> GO to <u>L3</u> .</p>

<b>L3 CHECK THE ISO 9141 CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the DLC C251-7, circuit 70 (LB/WH), harness side and ground.</li> </ul>  <p>A0076175</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>L4</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>L4 CHECK CIRCUIT 70 (LB/WH) BETWEEN THE RCM AND THE DLC FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the RCM C310a-11, circuit 70 (LB/WH), harness side and the DLC C251-7, circuit 70 (LB/WH), harness side.</li> </ul>  <p>A0058237</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>L5</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT all modules. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>L5 CHECK THE ISO 9141 CIRCUIT OPERATION WITH THE RCM CONNECTED</b>	
<ul style="list-style-type: none"> <li>• Connect: RCM C310a.</li> <li>• Ignition ON.</li> <li>• Connect: Negative Battery Cable.</li> <li>• Repeat the network test with the scan tool.</li> <li>• <b>Does the scan tool communicate with the RCM ?</b></li> </ul>	<p><b>Yes</b> If the vehicle is equipped with an FSSM , GO to <u>L6</u> .</p> <p>If the vehicle is not equipped with an FSSM , the system is operating correctly at this time.</p> <p><b>No</b> GO to <u>L8</u> .</p>
<b>L6 CHECK THE ISO CIRCUIT OPERATION WITH THE FSSM CONNECTED</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative battery cable. .</li> <li>• Wait at least 1 minute.</li> <li>• Connect: FSSM C3281a.</li> <li>• Ignition ON.</li> </ul>	<p><b>Yes</b> The system is operating correctly at this time.</p> <p><b>No</b> GO to <u>L7</u> .</p>

<ul style="list-style-type: none"> <li>• Repeat the network test with the scan tool.</li> <li>• <b>Does the scan tool communicate with the FSSM ?</b></li> </ul>	
<b>L7 CHECK FOR CORRECT FSSM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the FSSM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the FSSM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new FSSM . REFER to <u>Section 100-02B</u> . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
<b>L8 CHECK FOR CORRECT RCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the RCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the RCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new RCM . CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### **Pinpoint Test M: No Standard Corporate Protocol (SCP) Network Communications, All Modules Are Not Responding**

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

#### **Normal Operation**

The Standard Corporate Protocol (SCP) network has an unshielded twisted pair cable. The SCP network permits intermodule communication between the Data Link Connector (DLC) and the network modules.

#### **This pinpoint test is intended to diagnose the following:**

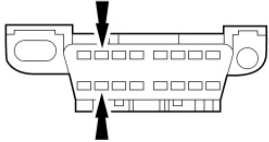
- Wiring, terminals or connectors
- Driver Door Module (DDM) (if equipped)
- HVAC module (if equipped)
- Instrument Cluster (IC)
- Lighting Control Module (LCM)

#### **PINPOINT TEST M: NO SCP NETWORK COMMUNICATION, ALL MODULES ARE NOT RESPONDING**

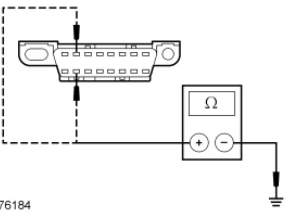
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

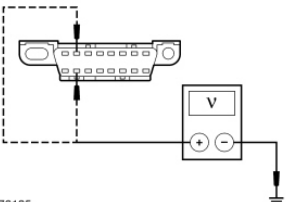
**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>M1 CHECK DLC PINS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect the scan tool cable from the Data Link Connector (DLC).</li> <li>• Inspect the DLC pins 2 and 10 for damage.</li> </ul>  <p>N0053445</p> <ul style="list-style-type: none"> <li>• Are the DLC pins 2 and 10 OK?</li> </ul>	<p><b>Yes</b> GO to <u>M2</u> .</p> <p><b>No</b> REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>M2 CHECK THE VEHICLE FOR AN HVAC MODULE</b>	
<ul style="list-style-type: none"> <li>• Check the vehicle for an HVAC module.</li> <li>• Is the vehicle equipped with an HVAC module?</li> </ul>	<p><b>Yes</b> GO to <u>M3</u> .</p> <p><b>No</b> GO to <u>M4</u> .</p>
<b>M3 CHECK THE SCP NETWORK WITH THE HVAC MODULE DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: HVAC Module C228a.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Does the scan tool communicate with the SCP network?</li> </ul>	<p><b>Yes</b> GO to <u>M10</u> .</p> <p><b>No</b> GO to <u>M4</u> .</p>
<b>M4 CHECK THE VEHICLE FOR A DDM</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the vehicle for a DDM .</li> <li>• Is the vehicle equipped with a DDM ?</li> </ul>	<p><b>Yes</b> GO to <u>M5</u> .</p> <p><b>No</b> GO to <u>M6</u> .</p>
<b>M5 CHECK THE SCP NETWORK WITH THE DDM DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>• Disconnect: DDM C501a.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> </ul>	<p><b>Yes</b> CONNECT all modules. GO to <u>M11</u> .</p> <p><b>No</b></p>



<ul style="list-style-type: none"> <li>• Does the scan tool communicate with the SCP network?</li> </ul>	GO to <u>M6</u> .
<b>M6 CHECK THE SCP NETWORK WITH THE LCM DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145a.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Does the scan tool communicate with the SCP network?</li> </ul>	<p><b>Yes</b> CONNECT all modules. GO to <u>M12</u> .</p> <p><b>No</b> GO to <u>M7</u> .</p>
<b>M7 CHECK THE SCP NETWORK WITH THE IC DISCONNECTED</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: IC C2220.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: Network Test.</li> <li>• Does the scan tool communicate with the SCP network?</li> </ul>	<p><b>Yes</b> CONNECT all modules. GO to <u>M13</u> .</p> <p><b>No</b> GO to <u>M8</u> .</p>
<b>M8 CHECK THE SCP NETWORK CIRCUITS FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the DLC C251-2, circuit 914 (TN/OG), harness side and ground; and between the DLC C251-10, circuit 915 (PK/LB), harness side and ground.</li> </ul>  <p>A0076184</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>M9</u> .</p> <p><b>No</b> REPAIR the circuit. CONNECT all modules. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>
<b>M9 CHECK THE SCP NETWORK CIRCUITS FOR A SHORT TO VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the DLC C251-2, circuit 914 (TN/OG), harness side and ground; and between the DLC C251-10, circuit 915 (PK/LB), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR the circuit. CONNECT all modules. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CONNECT all modules.</p>

 <p>A0076185</p> <ul style="list-style-type: none"> <li>• Is any voltage indicated?</li> </ul>	
<b>M10 CHECK FOR CORRECT HVAC MODULE OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the HVAC module connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the HVAC module connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b>            INSTALL a new HVAC module. REFER to <a href="#">Section 412-01</a> .            CONNECT all modules. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b>            The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CONNECT all modules.</p>
<b>M11 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b>            INSTALL a new DDM . REFER to <a href="#">Section 419-10</a> . CONNECT all modules. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b>            The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CONNECT all modules.</p>
<b>M12 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b>            INSTALL a new LCM . REFER to <a href="#">Section 419-10</a> . CONNECT all modules. CLEAR the DTCs. REPEAT the network test with the scan tool.</p> <p><b>No</b>            The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CONNECT all modules.</p>
<b>M13 CHECK FOR CORRECT IC OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the IC connectors.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> </ul> </li> </ul>	<p><b>Yes</b>            INSTALL a new IC . REFER to <a href="#">Section 413-01</a> . CONNECT all modules. CLEAR the DTCs.</p>

<ul style="list-style-type: none"> <li>♦ damaged pins</li> <li>♦ pushed-out pins</li> <li>• Connect all the IC connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p>REPEAT the network test with the scan tool.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CONNECT all modules.</p>
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### Pinpoint Test N: No Power To The Scan Tool

Refer to Wiring Diagrams Cell 14 , Module Communications Network for schematic and connector information.

#### Normal Operation

The scan tool is connected to the Data Link Connector (DLC) to communicate with the High Speed Controller Area Network (HS-CAN), the Standard Corporate Protocol (SCP), and the ISO 9141 network.

A loss of ground or poor ground at the DLC may results in HS-CAN faults while the scan tool is connected.

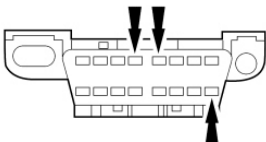
**This pinpoint test is intended to diagnose the following:**

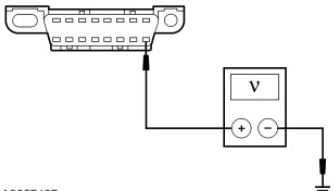
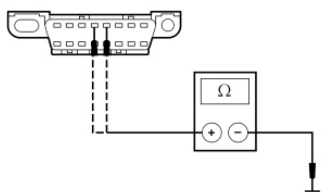
- Fuse
- Wiring, terminals or connectors
- Scan tool

#### PINPOINT TEST N: NO POWER TO THE SCAN TOOL

**NOTE:** Most faults are due to connector and/or wiring concerns. Carry out a thorough inspection and verification before proceeding with the pinpoint test.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to Section 414-01 .

Test Step	Result / Action to Take
<b>N1 CHECK DLC PINS FOR DAMAGE</b>	
<ul style="list-style-type: none"> <li>• Disconnect the scan tool cable from the DLC .</li> <li>• Inspect the DLC pins 4, 5 and 16 for damage.</li> </ul>  <p>N0050767</p> <ul style="list-style-type: none"> <li>• <b>Are the DLC pins 4, 5 and 16 OK?</b></li> </ul>	<p><b>Yes</b> GO to <u>N2</u> .</p> <p><b>No</b> REPAIR the DLC as necessary. CLEAR the DTCs. REPEAT the network test with the scan tool.</p>


<b>N2 CHECK THE DLC VOLTAGE SUPPLY CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the voltage between the DLC C251-16, circuit 40 (LB/WH), harness side and ground.</li> </ul>  <p>A0057467</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>N3</u> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 16 (20A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the short circuit. REPEAT the network test with the scan tool.</p>
<b>N3 CHECK THE DLC GROUND CIRCUITS FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the DLC C251-4, circuit 57 (BK), harness side and ground; and between the DLC C251-5, circuit 570 (BK/WH), harness side and ground.</li> </ul>  <p>A0060571</p> <ul style="list-style-type: none"> <li>• Are the resistances less than 5 ohms?</li> </ul>	<p><b>Yes</b> REPAIR the scan tool. CONNECT the negative battery cable. REPEAT the network test with the scan tool.</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. REPEAT the network test with the scan tool.</p>



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## Module Configuration

### Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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### Principles of Operation

Configurable modules accommodate a variety of vehicle options, eliminating the need for many unique modules for one vehicle line. These modules must be configured when replaced as part of a repair procedure. Configurable modules should not be exchanged between vehicles since the settings are unique to each vehicle. Failure to configure a new module may result in incorrect operation and/or DTCs setting.

The following are the 3 different methods of configuration:

- Programmable Module Installation (PMI)
- Module reprogramming ("flashing")
- Programmable parameters

Some modules do not support all 3 methods.

### Definition of Terms

The following are definitions of configuration terms:

#### Programmable Module Installation (PMI)

PMI is a scan tool process which configures settings in a new module. Data used for the PMI process is automatically downloaded from the original module and stored when a scan tool session is started. If this data cannot be retrieved from the module being replaced, the scan tool may prompt for As-Built data entry or display a list of parameter values that need to be manually selected. Some modules are reprogrammed during PMI when a strategy/calibration update is available. To carry out PMI, refer to Programmable Module Installation (PMI) in this section.

**NOTE:** It is important that the scan tool identifies the vehicle and obtains configuration data prior to removing any modules. The new module must be able to communicate with the scan tool in order to carry out PMI.

#### Module Reprogramming

Module reprogramming (also referred to as "flashing") is a scan tool process which updates the strategy/calibration in a module. Reprogramming a module with the same level of software will not improve module operation or repair a hardware failure. Module reprogramming is automatically carried out during PMI when a later strategy/calibration is available.

**NOTE:** Module reprogramming should be limited to circumstances where a published TSB procedure recommends doing so.

**NOTE:** A module cannot communicate with other modules on the communication network while being reprogrammed. Clear any network communication DTCs which may have been set in other modules during the reprogramming process.

### Programmable Parameters

Programmable parameters are customer preference items that may be modified by the dealer via scan tool or in some cases modified by the customer following a procedure listed in the vehicle Owner's Literature. While many configuration options may exist for a module, only a few of these options are programmable parameters.

### Adaptive Learning and Calibration

Some modules require a separate learning procedure be carried out if replaced as part of a repair procedure. For adaptive learning and calibration instructions, refer to the specific module removal and installation procedures.

### Vehicle Identification (VID) Block

Some PCMs contain a memory area called a Vehicle Identification (VID) block. The PCM VID block commonly stores powertrain configuration items such as Vehicle Identification Number (VIN), tire size, axle ratio, and whether or not the vehicle is equipped with cruise control.

### Module Address

A unique module address is assigned to each module on the network for identification.

### As-Built Data

As-Built data is a VIN -specific module configuration record. During vehicle build, the configuration from all modules is downloaded and stored in the As-Built database. As-Built data will not reflect customer preference items that have been changed from the default state. These items will need to be changed using programmable parameters after the module is configured.

The following chart lists As-Built data addresses and describes specific module configuration information:

**Module Configuration and Parameter Chart**

Module	Module Address	Requires PMI	Reprogram/Flash Capable	Adaptive Learning or Calibration Items	Available Programmable Parameters
ABS module	760	Yes	Yes	None	<ul style="list-style-type: none"> <li>• Tire size</li> </ul>
Driver Door Module (DDM)	A0	Yes	No	None	<ul style="list-style-type: none"> <li>• Autolocking</li> <li>• Auto-unlocking</li> <li>• Lock confirmation flash (police option only)</li> </ul>

					<ul style="list-style-type: none"> <li>• Smart unlocking</li> <li>• Tire placard pressure</li> <li>• Wigwag lighting (police option only)</li> </ul>
Fire Suppression System Module (FSSM) (police option only)	59	No	No	None	None
HVAC module	98	No	No	None	None
Instrument Cluster (IC)	720	Yes	Yes	None	None
Lighting Control Module (LCM)	70	Yes	No	None	<ul style="list-style-type: none"> <li>• Daytime Running Lamps (DRL)</li> <li>• Dark mode lighting (police option only)</li> <li>• Turn signal warning chime</li> </ul>
PCM	7E0	Yes	Yes	<ul style="list-style-type: none"> <li>• Adaptive airflow</li> <li>• Idle speed</li> <li>• Refueling event</li> <li>• Fuel trim</li> </ul>	<ul style="list-style-type: none"> <li>• Axle ratio</li> <li>• Tire size</li> <li>• Speed control</li> </ul>
Restraints Control Module (RCM)	58	Yes	None	<ul style="list-style-type: none"> <li>• Seat weight sensor re-zero</li> </ul>	None
Vehicle Dynamics Module (VDM)	721	No	Yes	None	None

### Inspection and Verification

This section provides step-by-step module configuration procedures. Carry out the Programmable Module Installation (PMI) procedure in this section when another workshop manual section directs to carry out configuration or when DTCs from the below list are present:

### DTC Chart

DTC	Description	Source	Action
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B2477	Module Configuration Failure	<ul style="list-style-type: none"> <li>• ABS module</li> <li>• Driver Door Module (DDM)</li> <li>• Instrument Cluster (IC)</li> <li>• Lighting Control Module (LCM)</li> <li>• Restraints Control Module (RCM)</li> <li>• Vehicle Dynamics Module (VDM)</li> </ul>	CARRY OUT Programmable Module Installation (PMI). REFER to <u>Programmable Module Installation (PMI)</u> in this section.
B2477	Module Configuration Failure	<ul style="list-style-type: none"> <li>• Fire Suppression System Module (FSSM)</li> </ul>	REFER to <u>Section 100-02B</u> .
B2900	VIN Mismatch	<ul style="list-style-type: none"> <li>• ABS module</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.
B2900	VIN Mismatch	<ul style="list-style-type: none"> <li>• FSSM</li> </ul>	REFER to <u>Section 100-02B</u> .
P0602	Powertrain Control Module Programming Error	<ul style="list-style-type: none"> <li>• PCM</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.
P0605	Internal Control Module Read-Only Memory (ROM) Error	<ul style="list-style-type: none"> <li>• PCM</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.
P0630	VIN Not Programmed or Incompatible - ECM /PCM	<ul style="list-style-type: none"> <li>• FSSM</li> </ul>	REFER to <u>Section 100-02B</u> .
P1639	Vehicle ID Block Corrupted, Not Programmed	<ul style="list-style-type: none"> <li>• PCM</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.
U0300	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> <li>• PCM</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.
U2050	No Application Present	<ul style="list-style-type: none"> <li>• ABS module</li> <li>• DDM</li> <li>• IC</li> <li>• PCM</li> <li>• VDM</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.
U2051	One or More Calibration Files Missing / Corrupt	<ul style="list-style-type: none"> <li>• PCM</li> </ul>	CARRY OUT PMI . REFER to <u>Programmable Module Installation (PMI)</u> in this section.



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**Programmable Module Installation (PMI)**

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**Programmable Module Installation (PMI) Using the Integrated Diagnostic System (IDS) When the Original Module is Available**

**NOTE:** Following module installation, some modules require a separate procedure be carried out. For instructions, refer to the specific module removal and installation procedures.

1. Connect the IDS and identify the vehicle as normal.
2. From the Toolbox icon, select Module Programming and press the check mark.
3. Select Programmable Module Installation.
4. Select the module that is being replaced.
5. Follow the on-screen instructions, turn the ignition key to the OFF position, and press the check mark.
6. Install the new module and press the check mark.
7. Follow the on-screen instructions, turn the ignition key to the ON position, and press the check mark.
8. The IDS downloads the data into the new module and displays Module Configuration Complete.
9. Test module for correct operation.

**Programmable Module Installation (PMI) Using the Integrated Diagnostic System (IDS) When the Original Module is NOT Available**

**NOTE:** Following module installation, some modules require a separate procedure be carried out. For instructions, refer to the specific module removal and installation procedures.

1. Install the new module.
2. Connect the IDS and identify the vehicle as normal.
3. From the Toolbox icon, select Module Programming and press the check mark.
4. Select Programmable Module Installation.
5. Select the module that was replaced.

6. Follow the on-screen instructions, turn the ignition key to the OFF position, and press the check mark.
  7. Follow the on-screen instructions, turn the ignition key to the ON position, and press the check mark.
  8. If the data is not available, the IDS displays a screen stating to contact the As-Built Data Center.  
Retrieve the data from the technician service publication website at this time and press the check mark.
  9. Enter the module data and press the check mark.
  10. The IDS downloads the data into the new module and displays Module Configuration Complete.
  11. Test module for correct operation.
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**Anti-Theft**

**NOTE:** The police interceptor package does not include the Passive Anti-Theft System (PATS). Make sure the vehicle is not equipped with a police interceptor package before investigating any potential PATS -related no-start issues.

PATS consists of the following components:

- Anti-theft indicator (located in the light sensor)
- Encoded ignition key(s) (the key contains a transponder)
- PATS transceiver
- PCM

PATS uses radio frequency identification technology to deter a drive-away theft. Passive means that it does not require any activity by the user.

**Passive Anti-Theft System (PATS) Function**

PATS function is controlled by the PCM. PATS uses the PCM to carry out all of the PATS functions such as receiving the identification code from the PATS key, controlling the starter and fuel injectors enable, and initiates the key interrogation sequence when the ignition key is turned to the ON or START position. All elements of PATS must be functional before the vehicle starts. If any of the components are not working correctly, the vehicle cannot start. If the PCM must be replaced for any reason (PATS concerns or driveability concerns), the PATS keys must be programmed into the new PCM. Refer to Key Programming Using Diagnostic Equipment in this section.

A PATS no-start may involve a vehicle no-start due to either the fuel injectors not operating or the starter not operating (starter relay does not close) or both. Always check for PATS DTCs from the PCM when a no-crank or no-start condition exists. A low state of charge in the vehicle battery may cause the PATS to allow starter operation, but prevent the fuel injectors from operating. If the PATS anti-theft indicator does not prove out (it may be either flashing or glowing steadily) and one (or both) of the previous conditions (fuel injectors and/or starter inoperative) are present, it may be due to a PATS issue. If the anti-theft indicator proves out, and the vehicle does not start, it is probably not a PATS issue. Refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual for non- PATS starting information. If the anti-theft indicator does not illuminate at all, it may be a light sensor/circuitry/PCM issue. GO to Symptom Chart.

The PATS function uses the PCM to enable or disable the engine. All elements of PATS must be functional before the engine is allowed to start. If any of the components are not working correctly, the vehicle cannot start. If there is a PATS concern present, the PCM does not allow fuel injector operation and also not allow starter operation. If the vehicle starts and stalls, or the engine cannot start at all, check the anti-theft indicator operation and if it is flashing or glowing, retrieve DTCs from the PCM and follow the PATS diagnostics in this section.

PATS is not compatible with aftermarket remote start systems, which allow the vehicle to be started from the exterior of the vehicle. These systems may reduce the security of the vehicle, and also may be the cause of no-start concerns. Remote start systems must be removed from the vehicle before any PATS -related no-start concerns are investigated.

### **Factory Invoiced Accessory (FIA)**

Vehicles may be equipped with a dealer-installed remote start system that is a Factory Invoiced Accessory (FIA). The remote start fob for this system uses a small device that is about half the size of a conventional RKE fob, but only has one button on it. If the remote start system is installed on the vehicle and the unlimited mode is not enabled, PATS allows up to 7 PATS keys to be programmed into the PCM. The remote start system uses up one of the 8 total PATS keys that can be programmed into the PCM. The number of keys that are programmed into the PATS can be determined by viewing the PCM PID N\_KEYCODE.

PATS is active only for a few seconds when the vehicle is starting. It is not a PATS concern if the vehicle stalls after it has been running for a minimum of 3 seconds. PATS does not disable a running vehicle.

PATS disables the vehicle from starting if there is:

- a damaged PATS key.
- an unprogrammed PATS key.
- a non-encoded (non- PATS ) key (a conventional key or one that does not have any electronics).
- damaged wiring.
- a damaged transceiver.
- a damaged PCM.

### **Unlimited Key Mode**

PATS contains a feature called unlimited key mode. This feature allows a customer to program more than 8 vehicle keys, if requested. Each vehicle in unlimited key mode is set up with a special, unlimited transponder security key code. This allows all the customer vehicles (or, one vehicle) to share the same mechanically cut keys (more than 8 keys). For an individual customer, any randomly selected security key that has been previously mechanically cut and electronically programmed to the vehicle is acceptable. Refer to Spare Key Programming - Unlimited Key Mode in this section.





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SECTION 419-01: Anti-Theft - Passive Anti-Theft System  
(PATS)  
DIAGNOSIS AND TESTING

2010 Crown Victoria, Grand Marquis  
Workshop Manual  
Procedure revision date: 08/19/2009

## Anti-Theft

### Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent
 ST3104-A	Backprobe pins POM6411 or equivalent

### Principles of Operation

#### Anti-Theft Indicator

**NOTE:** Replacement of the Passive Anti-Theft System (PATS) transceiver does not require the PATS keys to be programmed into the PCM again.

**NOTE:** A minimum of 2 PATS keys must be programmed into the PCM before the vehicle starts.

**NOTE:** Make sure any aftermarket remote start systems have been removed from the vehicle before any PATS -related no-start concerns are investigated.

**NOTE:** The police interceptor package does not include PATS .

PATS uses a visual anti-theft indicator located in the light sensor. The indicator proves out for 3 seconds when the ignition key is in the ON or START position under normal operation. If there is a PATS concern, this indicator either flashes rapidly or glows steadily when the ignition key is turned to the ON or START position. PATS also flashes the anti-theft indicator every 2 seconds when the ignition key is in the OFF position to act as a visual theft deterrent. For the anti-theft indicator/light sensor removal procedure, refer to Section 417-01 .

#### Encoded Passive Anti-Theft System (PATS) Keys

PATS uses a special ignition key that is larger than a conventional ignition key because it contains a permanently-installed electronic device called a transponder. Each transponder contains a unique encrypted identification code which is one of a very large number of combinations. The addition of this transponder to the key makes it an "encoded" key. The PATS key does not require batteries and should last the lifetime of the vehicle. Each PATS key must be programmed into the PCM before it can be used to start the vehicle. There are special procedures described in this section that must be carried out if a new PATS key is necessary. Refer

to [Key Programming Using Diagnostic Equipment](#) or [Key Programming Using Two Programmed Keys](#) in this section.

### **Passive Anti-Theft System (PATS) Transceiver**

The PATS transceiver is located under the steering column shroud and communicates with the encoded ignition key. During each vehicle start sequence, the PATS transceiver reads the encoded ignition key identification code and sends data to the PCM. The PCM validates the code, and if it is the correct code, grounds the starter relay solenoid coil and allows the fuel injectors to operate. Refer to [Passive Anti-Theft System \(PATS\) Transceiver](#) in this section.

### **Passive Anti-Theft System (PATS) Operation**

The PATS function is controlled by the PCM. When the ignition switch is turned to the ON or START position, the PCM initiates the key interrogation sequence by sending a voltage signal to the PATS transceiver. The transceiver then uses its antenna to communicate with the transponder in the PATS key. This process "reads" the PATS key identification code and sends the key identification code back to the PCM, which interprets it and determines if it matches one of the stored key codes. If it does match one of the stored key codes, the PCM allows ground to the starter relay solenoid coil when in start and allows fuel injector operation. If it does not match one of the stored key codes, or it is only a partial key read or no key read, the PCM does not ground the starter relay solenoid coil and does not allow fuel injector operation. The anti-theft indicator in the light sensor flashes (or may glow steadily) and the PCM stores one or more DTCs. All elements of PATS must be functional before the vehicle starts. If any of the components are not working correctly, the vehicle cannot start. If the PCM must be replaced for any reason (PATS concerns or driveability concerns), the PATS keys must be programmed into the new PCM. Refer to [Key Programming Using Diagnostic Equipment](#) in this section.

PATS is active only for a few seconds when the vehicle is starting. It is not a PATS concern if the vehicle stalls after it has been running for a minimum of 3 seconds. PATS does not disable a running vehicle. The PATS may cause a vehicle no start due to either the fuel injectors not operating or the starter not operating (starter relay does not close) or both. Always check for PATS DTCs from the PCM when a no-crank or no-start condition exists. A low state of charge in the vehicle battery may cause the PATS to allow starter operation, but prevent the fuel injectors from operating. If the anti-theft indicator does not prove out (it may be either flashing or glowing steadily) and one (or both) of the previous conditions (fuel injectors and/or starter inoperative) are present, it may be due to a PATS issue. If the anti-theft indicator proves out, it may not be a PATS issue. If the anti-theft indicator does not illuminate at all, it may be a light sensor/circuitry/PCM issue. GO to [Symptom Chart](#).

The PATS disables the vehicle from starting if there is:

- a damaged PATS key.
- a non-programmed PATS key.
- a non- PATS key (a conventional key or one that does not have any electronics).
- damaged wiring.
- a damaged transceiver.
- a damaged PCM.

### **Passive Anti-Theft System (PATS) PIDs**

Monitoring the PATS PIDs can be very useful in determining which diagnostic steps to follow. Viewing the MASTERKEY (master key) PID (with both keys) determines if the key is a programmed key and also prove out the transceiver, circuitry and the PCM. A master key is any key that is programmed into the PCM. Viewing the MIN\_KEYS (minimum number of keys) PID (this PID does not change) determines the minimum number of keys that must be programmed into the PCM. There must be at least 2 keys programmed



into the PCM in this system. Viewing the N\_KEYCODE (number of keys programmed) PID determines if the minimum number of keys have been programmed into the PCM. If the N\_KEYCODE PID reads 0 or 1, additional key(s) need(s) to be programmed into the PCM in order to meet the minimum of 2 keys. If the N\_KEYCODE PID reads 0 or 1, and the MASTERKEY PID reads Not Present, that particular key must be programmed into the PCM. If the N\_KEYCODE PID reads 1, and the MASTERKEY PID reads Present, that particular key is already programmed into the PCM.

The SPAREKEY (spare key) PID is defaulted to ENABLE. It can be toggled to DISABLE if the customer does not want any more than 2 keys programmed into the PCM using the Key Programming Using Two Programmed Keys procedure. Refer to Key Programming Switch State Control in this section to change the state of the SPAREKEY PID.

### Unlimited Key Mode

This system contains a feature named unlimited key mode (PID of UNL\_KEY\_MODE). This feature allows a customer to program more than 8 keys to their vehicle if they request it. Each vehicle in unlimited key mode is set up with a special unlimited transponder security key code. This allows all the customer vehicles to share the same mechanically cut keys, but no other keys from outside can be used to operate the vehicle(s). Any randomly selected security key that has been previously mechanically cut and electronically programmed to the vehicle is acceptable. Refer to Spare Key Programming - Unlimited Key Mode in this section.

### Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Large metallic objects or electronic devices on the key ring that can be used to purchase gasoline or similar items</li> <li>• Ignition lock cylinder</li> <li>• Passive Anti-Theft System (PATS) key</li> <li>• Use of a non- PATS key or incorrect PATS key</li> <li>• More than one PATS key on key ring</li> <li>• Remote start system installed</li> </ul>	<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):               <ul style="list-style-type: none"> <li>◆ 4 (10A)</li> <li>◆ 24 (10A)</li> </ul> </li> <li>• Wiring, terminals or connectors</li> <li>• PCM</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to [Section 418-00](#) , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to [Section 418-00](#) to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#) .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the PCM.

9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in [Section 419-10](#) .

10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#) .

## DTC Charts

### PCM DTC Chart

DTC	Description	Action
B1213	Anti-Theft Number of Programmed Keys is Below Minimum	If DTC B1600, B1601, B1602, B1681, B2103 or B2431 is also present, they must be addressed first. If DTC B1213 is the only DTC present, PROGRAM additional keys. REFER to <a href="#">Key Programming Using Diagnostic Equipment</a> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.
B1342	ECU is Faulted	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new PCM. REFER to <a href="#">Section 303-14</a> . PROGRAM the keys. REFER to <a href="#">Key Programming Using Diagnostic Equipment</a> in this section. CYCLE the ignition. REPEAT the self-test.
B1600	PATS Ignition Key Transponder Signal Is Not Received	<a href="#">GO to Pinpoint Test B</a> .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	<a href="#">GO to Pinpoint Test C</a> .
B1602	PATS Received Invalid Format of Key-Code From Ignition Key Transponder	<a href="#">GO to Pinpoint Test D</a> .
B1681	PATS Transceiver Module Signal Is Not Received	<a href="#">GO to Pinpoint Test E</a> .
B2103	Antenna Not Connected	<a href="#">GO to Pinpoint Test A</a> .

B2431	Transponder Programming Failed	The ignition key was not programmed. PROGRAM the key. REFER to <u>Spare Key Programming - Using Diagnostic Equipment</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.
P1260	Theft Detected, Vehicle Immobilized	If there are any other Passive Anti-Theft System (PATS) DTCs, ADDRESS them first. If DTC P1260 is the only DTC present, there may be a power or ground concern with the PCM. REFER to the Wiring Diagrams Manual.
All other DTCs	-	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: DTC B2103

#### Normal Operation

The Passive Anti-Theft System (PATS) transceiver reads the PATS key when the key is turned to the START or ON position.

- DTC B2103 (Antenna Not Connected) - sets when the PCM detects a PATS transceiver antenna failure. The PATS transceiver may need to be replaced.

**This pinpoint test is intended to diagnose the following:**

- PATS transceiver

#### PINPOINT TEST A: DTC B2103

Test Step	Result / Action to Take
<b>A1 INSPECT THE PATS TRANSCEIVER FOR CORRECT INSTALLATION</b>	
<p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Verify the PATS transceiver is correctly installed. Refer to <u>Passive Anti-Theft System (PATS) Transceiver</u></li> </ul>	<p><b>Yes</b> INSTALL a new PATS transceiver. REFER to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p><b>No</b> The system is OK.</p>

in this section. • Ignition ON. • Clear the DTCs. • Ignition OFF. • Ignition ON. • Retrieve the DTCs. • <b>Is DTC B2103 retrieved?</b>	
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**Pinpoint Test B: DTC B1600****Normal Operation**

- DTC B1600 ( PATS Ignition Key Transponder Signal Is Not Received) - sets when no Passive Anti-Theft System (PATS) key has been read by the PCM.

**This pinpoint test is intended to diagnose the following:**

- PATS key
- PATS transceiver
- PCM

**PINPOINT TEST B: DTC B1600**

**NOTE:** Large metallic objects, electronic devices on the key ring that can be used to purchase gasoline or similar items, or a second key on the same key ring as the PATS key can cause a vehicle starting concern and record DTCs under certain conditions. If a fault cannot be identified, examine the customer key ring for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS key while starting the engine. These objects and devices cannot damage the PATS key, but can cause a momentary concern if they are too close to the key during engine start. If a concern occurs, turn the key off and restart the engine with all other objects on the key ring held away from the ignition key. Check to make sure the PATS key used by the customer is an approved Ford PATS key. ( PATS keys from Ford, Rotunda, Strattec, or Huf are approved Ford PATS keys.)

Test Step	Result / Action to Take
<b>B1 RETRIEVE THE DTCs</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• Retrieve the DTCs.</li> <li>• <b>Is DTC B1600 retrieved?</b></li> </ul>	<p><b>Yes</b> GO to <b>B2</b> .</p> <p><b>No</b> If DTCs other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>If no PATS DTCs are retrieved, the system is OK. The concern may have been interference from another object.</p>
<b>B2 CHECK BOTH PATS KEYS</b>	
<p><b>NOTE:</b> Check to make sure the new PATS keys are approved Ford encoded PATS keys. Unapproved PATS keys</p>	<p><b>Yes</b> If DTC B1600 was present for all keys, GO to <b>B3</b> .</p> <p>If DTC B1600 was not present for one of the keys, the</p>

<p>do not always operate correctly over various temperature ranges. ( PATS keys from Ford, Rotunda, Strattec, or Huf are approved Ford PATS keys.)</p> <ul style="list-style-type: none"> <li>• Obtain both PATS keys from the customer and follow the procedure using one PATS key, then the other. If the customer only has one PATS key, it is necessary to cut a new PATS key.</li> <li>• If it is necessary to cut a new PATS key, program the new PATS key. Refer to <u>Key Programming Using Diagnostic Equipment</u> in this section.</li> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• Retrieve the DTCs.</li> <li>• <b>Using either existing key(s) or the new key (if a new one was cut and programmed), is DTC B1600 present?</b></li> </ul>	<p>other key may be damaged and should be replaced. CUT a new key to replace the damaged key. REFER to <u>Key Programming Using Diagnostic Equipment</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test. TEST the system for normal operation.</p> <p><b>No</b> If DTCs other than PATS PCM DTCs are retrieved, REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.</p> <p>If no PATS DTCs are retrieved, the system is OK. The concern may have been caused by interference from another object.</p>
<p><b>B3 INSTALL A NEW PATS TRANSCIVER</b></p>	
<p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <p><b>NOTE:</b> Do not use the new PATS key that may have been programmed in Step B2.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Install a new PATS transceiver. Refer to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section.</li> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• Retrieve the DTCs.</li> <li>• <b>Is DTC B1600 retrieved?</b></li> </ul>	<p><b>Yes</b> GO to <u>B4</u> .</p> <p><b>No</b> The system is OK.</p>
<p><b>B4 CHECK FOR CORRECT PCM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . PROGRAM the PATS keys into the PCM. REFER to <u>Key Programming Using Diagnostic Equipment</u> in this section. REPEAT the self-test.</p>

<ul style="list-style-type: none"> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>No</b></p> <p>The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>
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**Pinpoint Test C: DTC B1601****Normal Operation**

- DTC B1601 ( PATS Received Incorrect Key-Code From Ignition Key Transponder) - sets when there is an unprogrammed Passive Anti-Theft System (PATS) key. There is no issue with the PATS key itself, but the key must be programmed into the PATS memory (unless the maximum number of keys are already programmed).

**This pinpoint test is intended to diagnose the following:**

- PATS key
- PCM

**PINPOINT TEST C: DTC B1601**

**NOTE:** Large metallic objects, electronic devices on the key ring that can be used to purchase gasoline or similar items, or a second key on the same key ring as the PATS key can cause a vehicle starting concern and record DTCs under certain conditions. If a fault cannot be identified, examine the customer key ring for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS key while starting the engine. These objects and devices cannot damage the PATS key, but can cause a momentary concern if they are too close to the key during engine start. If a concern occurs, turn the ignition switch off and restart the engine with all other objects on the key ring held away from the ignition key. Check to make sure the PATS key used by the customer is an approved Ford PATS key. ( PATS keys from Ford, Rotunda, Strattec, or Huf are approved Ford PATS keys.)

**NOTE:** Only 8 PATS keys can be programmed into the PCM using the Key Programming Using Diagnostic Equipment procedure unless the unlimited key mode is active. If the N\_KEYCODE PID reads more than 2, the concern may be the PATS key being used is an unprogrammed key. Verify this by also viewing the MASTERKEY PID. It must read Present for the key to be valid.

Test Step	Result / Action to Take
<b>C1 RETRIEVE THE DTCs</b>	
<ul style="list-style-type: none"> <li>• <b>NOTE:</b> Follow this procedure using both PATS keys (using one at a time).</li> <li>• If only one key is available, cut a new key and program the keys. Refer to <u>Key Programming Using Diagnostic Equipment</u> in this section.</li> <li>• If both keys are available, program the keys. Refer to <u>Key Programming Using Diagnostic Equipment</u> in this section.</li> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Ignition OFF.</li> </ul>	<p><b>Yes</b></p> <p>If DTC B1601 is retrieved for one PATS key, REPLACE that key and PROGRAM all the keys. REFER to <u>Key Programming Using Diagnostic Equipment</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p>If DTC B1601 is retrieved for both PATS keys, GO to <u>C2</u> .</p> <p><b>No</b></p> <p>The system is OK. CHECK all the customer PATS keys by attempting to start the vehicle with each key</p>

<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Retrieve the DTCs.</li> <li>• <b>Is DTC B1601 retrieved for one or both PATS keys?</b></li> </ul>	to verify all the other PATS keys are programmed.
<b>C2 CHECK FOR CORRECT PCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . PROGRAM the PATS keys into the PCM. REFER to <u>Key Programming Using Diagnostic Equipment</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test D: DTC B1602****Normal Operation**

- DTC B1602 ( PATS Received Invalid Format Of Key-Code From Ignition Key Transponder) - sets when only a partial Passive Anti-Theft System (PATS) key was read. Remote starter equipment can also cause this DTC.

**This pinpoint test is intended to diagnose the following:**

- PATS key
- PATS transceiver
- PCM

**PINPOINT TEST D: DTC B1602**

**NOTE:** Large metallic objects, electronic devices on the key ring that can be used to purchase gasoline or similar items, or a second key on the same key ring as the PATS key can cause a vehicle starting concern and record DTCs under certain conditions. If a fault cannot be identified, examine the customer key ring for such objects or devices. If present, inform the customer that they need to keep these objects from touching the PATS key while starting the engine. These objects and devices cannot damage the PATS key, but can cause a momentary concern if they are too close to the key during engine start. If a concern occurs, turn the ignition off and restart the engine with all other objects on the key ring held away from the ignition key. Check to make sure the PATS key used by the customer is an approved Ford PATS key. ( PATS keys from Ford, Rotunda, Strattec, or Huf are approved Ford PATS keys.)

**NOTE:** Make sure any aftermarket remote start systems have been removed from the vehicle before any PATS -related no-start concerns are investigated.

Test Step	Result / Action to Take
<b>D1 RETRIEVE THE DTCs</b>	
	<p><b>Yes</b> If DTC B1602 is retrieved for one key, REPLACE that key</p>

<ul style="list-style-type: none"> <li>• <b>NOTE:</b> Follow this procedure using both PATS keys (using one at a time).</li> <li>• If only one key is available, cut a new key and program the keys. Refer to <u>Key Programming Using Diagnostic Equipment</u> in this section.</li> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• Retrieve the DTCs.</li> <li>• <b>Is DTC B1602 retrieved for one or both PATS keys?</b></li> </ul>	<p>and PROGRAM the new key. REFER to <u>Spare Key Programming - Using Diagnostic Equipment</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p>If DTC B1602 is retrieved for both PATS keys, GO to <u>D2</u> .</p> <p><b>No</b> The system is OK. CHECK all the customer PATS keys by attempting to start the vehicle with each key to verify all the other PATS keys are programmed. The concern may have been caused by interference from another object.</p>
<b>D2 INSTALL A NEW PATS TRANSCIVER</b>	
<p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Install a new PATS transceiver. Refer to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section.</li> <li>• Ignition ON.</li> <li>• Clear the DTCs.</li> <li>• Ignition OFF.</li> <li>• Ignition ON.</li> <li>• Retrieve the DTCs.</li> <li>• <b>Are any PATS DTCs retrieved?</b></li> </ul>	<p><b>Yes</b> GO to <u>D3</u> .</p> <p><b>No</b> The system is OK. CHECK all the customer PATS keys by attempting to start the vehicle with each key to verify all the other PATS keys are programmed.</p>
<b>D3 CHECK FOR CORRECT PCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . PROGRAM the PATS keys into the PCM. REFER to <u>Key Programming Using Diagnostic Equipment</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Pinpoint Test E: DTC B1681**

Refer to Wiring Diagrams Cell 112 , Passive Anti-Theft System for schematic and connector information.



**Normal Operation**

The Passive Anti-Theft System (PATS) transceiver receives voltage from the Central Junction Box (CJB) fuse 24 (10A). The PATS transceiver and the PCM communicate on the transmit (TX) and receive (RX) circuits. The PCM compares the key code stored in memory and enables the starter if the key code is correct.

- DTC B1681 ( PATS Transceiver Module Signal Is Not Received) - sets when the PATS transceiver signal is not received by the PCM. This DTC can be caused by circuits to the PATS transceiver, circuits between the PATS transceiver and the PCM, the PATS transceiver or the PCM.

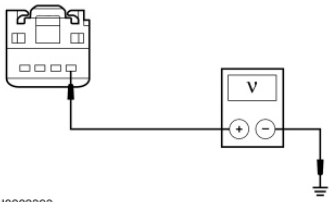
**This pinpoint test is intended to diagnose the following:**

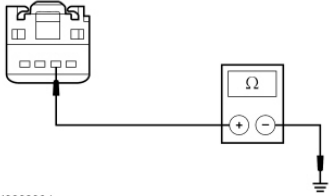
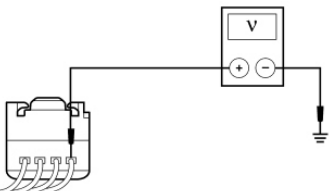
- Fuse
- PATS key
- PATS transceiver
- Wiring, terminals or connectors
- PCM

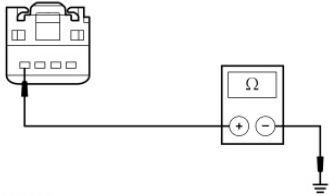
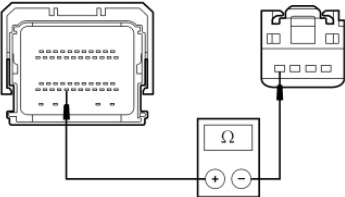
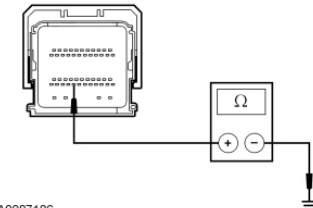
**PINPOINT TEST E: DTC B1681**

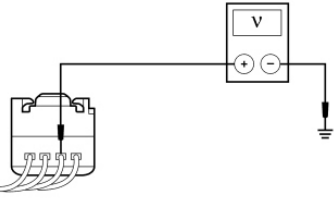
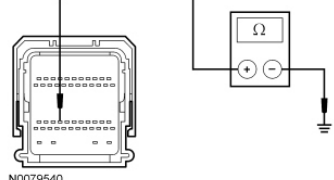
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

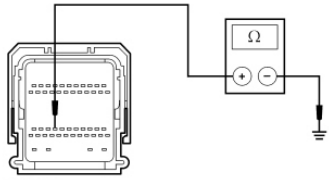
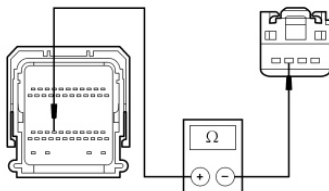
**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

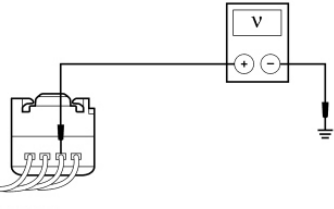
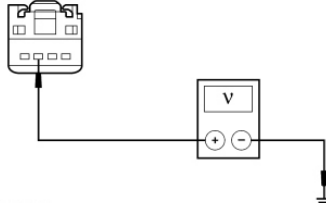
Test Step	Result / Action to Take
<b>E1 CHECK THE PATS TRANSCEIVER POWER CIRCUIT FOR VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PATS Transceiver C2007.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the PATS transceiver C2007-1, circuit 1266 (RD/YE), harness side and ground.</li> </ul>  <p>N0002393</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <u>E2</u> .</p> <p><b>No</b> VERIFY the CJB fuse 24 (10A) is OK. If OK, REPAIR the circuit. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>E2 CHECK THE PATS TRANSCEIVER GROUND CIRCUIT FOR AN OPEN</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the PATS transceiver C2007-2, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0002394</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <a href="#">E3</a> .</p> <p><b>No</b> REPAIR the circuit. CONNECT the negative battery cable. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p>
<p><b>E3 CHECK THE PATS TRANSCIEVER RECEIVE CIRCUIT FOR VOLTAGE</b></p>	
<p><b>NOTICE:</b> This pinpoint test step directs testing circuits using a back-probe method. Use the special back-probe tool specified in the tool list in this section. Do not force test leads or other probes into connectors. Adequate care must be exercised to avoid connector terminal damage while ensuring that good electrical contact is made with the circuit or terminal. Failure to follow these instructions may cause damage to wiring, terminals, or connectors and subsequent electrical faults.</p> <ul style="list-style-type: none"> <li>• Connect: PATS Transceiver C2007.</li> <li>• Ignition ON.</li> <li>• Measure the voltage by backprobing between the PATS transceiver C2007-4, circuit 1216 (GY/OG), harness side and ground.</li> </ul>  <p>N0002398</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 8 volts?</li> </ul>	<p><b>Yes</b> GO to <a href="#">E7</a> .</p> <p><b>No</b> GO to <a href="#">E4</a> .</p>
<p><b>E4 CHECK THE PATS TRANSCIEVER RECEIVE CIRCUIT FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175b.</li> <li>• Disconnect: PATS Transceiver C2007.</li> <li>• Measure the resistance between the PATS transceiver C2007-4, circuit 1216 (GY/OG), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <a href="#">E5</a> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test. If DTC B1681 is retrieved again, GO to <a href="#">E13</a> .</p>

 <p>N0002400</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	
<p><b>E5 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the PCM C175b-42, circuit 1216 (GY/OG), harness side, and the PATS transceiver C2007-4, circuit 1216 (GY/OG), harness side.</li> </ul>  <p>N0009251</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E6</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p>
<p><b>E6 CHECK THE PATS TRANSCEIVER RECEIVE CIRCUIT FOR A SHORT TO GROUND WITH THE PATS TRANSCEIVER CONNECTED</b></p>	
<p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <ul style="list-style-type: none"> <li>• Connect: PATS Transceiver C2007.</li> <li>• Measure the resistance between the PCM C175b-42, circuit 1216 (GY/OG), harness side and ground.</li> </ul>  <p>A0087186</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E13</u> .</p> <p><b>No</b> INSTALL a new PATS transceiver. REFER to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p>
<p><b>E7 CHECK THE PATS TRANSCEIVER TRANSMIT CIRCUIT FOR VOLTAGE</b></p>	
<p><b>NOTICE:</b> This pinpoint test step directs testing circuits using a back-probe method. Use the special back-probe tool specified in the tool list in this section. Do not force test leads or other probes into connectors. Adequate care must be exercised to avoid connector terminal damage while ensuring that good electrical contact is made with the circuit or terminal. Failure to follow</p>	<p><b>Yes</b> INSTALL a new PATS transceiver. REFER to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section. CLEAR the</p>

<p><b>these instructions may cause damage to wiring, terminals, or connectors and subsequent electrical faults.</b></p> <p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <ul style="list-style-type: none"> <li>• Measure the voltage by backprobing between the PATS transceiver C2007-3, circuit 1215 (WH/LG), harness side and ground.</li> </ul>  <p>N0002395</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage greater than 8 volts?</b></li> </ul>	<p>DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p>If DTC B1681 is retrieved again, GO to <u>E13</u> .</p> <p><b>No</b> GO to <u>E8</u> .</p>
<p><b>E8 CHECK THE PATS TRANSCIEVER TRANSMIT CIRCUIT FOR A SHORT TO GROUND WITH THE PATS TRANSCIEVER CONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175b.</li> <li>• Measure the resistance between the PCM C175b-31, circuit 1215 (WH/LG), harness side and ground.</li> </ul>  <p>N0079540</p> <ul style="list-style-type: none"> <li>• <b>Is the resistance greater than 10,000 ohms?</b></li> </ul>	<p><b>Yes</b> GO to <u>E10</u> .</p> <p><b>No</b> GO to <u>E9</u> .</p>
<p><b>E9 CHECK THE PATS TRANSCIEVER TRANSMIT CIRCUIT FOR A SHORT TO GROUND WITH THE PATS TRANSCIEVER DISCONNECTED</b></p>	
<p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <ul style="list-style-type: none"> <li>• Disconnect: PATS Transceiver C2007.</li> <li>• Measure the resistance between the PCM C175b-31, circuit 1215 (WH/LG), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new PATS transceiver. REFER to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p><b>No</b> REPAIR the circuit.</p>

 <p>N0079540</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p>CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p>
<p><b>E10 CHECK THE PATS TRANSCIEVER TRANSMIT CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: PATS Transceiver C2007.</li> <li>• Measure the resistance between the PCM C175b-31, circuit 1215 (WH/LG), harness side and the PATS transceiver C2007-3, circuit 1215 (WH/LG), harness side.</li> </ul>  <p>N0079541</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> GO to <u>E11</u> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p>
<p><b>E11 CHECK THE PATS TRANSCIEVER TRANSMIT CIRCUIT FOR VOLTAGE</b></p>	
<p><b>NOTICE:</b> This pinpoint test step directs testing circuits using a back-probe method. Use the special back-probe tool specified in the tool list in this section. Do not force test leads or other probes into connectors. Adequate care must be exercised to avoid connector terminal damage while ensuring that good electrical contact is made with the circuit or terminal. Failure to follow these instructions may cause damage to wiring, terminals, or connectors and subsequent electrical faults.</p> <p><b>NOTE:</b> Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.</p> <ul style="list-style-type: none"> <li>• Connect: PATS Transceiver C2007.</li> <li>• Connect: PCM C175b.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: PCM DataLogger.</li> <li>• Trigger the active command TRANSMIT to ON.</li> <li>• Measure the voltage by backprobing between the PATS transceiver C2007-3, circuit 1215 (WH/LG), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new PATS transceiver. REFER to <u>Passive Anti-Theft System (PATS) Transceiver</u> in this section. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p><b>No</b> GO to <u>E12</u> .</p>

 <p>N0002395</p> <p>• Is the voltage less than 5 volts?</p>	
<p><b>E12 CHECK THE PATS TRANSCIVER TRANSMIT CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175b.</li> <li>• Disconnect: PATS Transceiver C2007.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the PATS transceiver C2007-3, circuit 1215 (WH/LG), harness side and ground.</li> </ul>  <p>N0002835</p> <p>• Is any voltage indicated?</p>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. CYCLE the ignition. REPEAT the self-test.</p> <p><b>No</b> GO to <u>E13</u> .</p>
<p><b>E13 CHECK FOR CORRECT PCM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . PROGRAM the PATS keys into the PCM. REFER to <u>Key Programming Using Diagnostic Equipment</u> in this section. REPEAT the self-test.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test F: The Anti-Theft Indicator Is Always/Never On

Refer to Wiring Diagrams Cell 112 , Passive Anti-Theft System for schematic and connector information.

**Normal Operation**

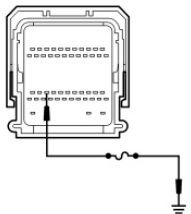
The Passive Anti-Theft System (PATS) uses a visual anti-theft indicator located in the light sensor. This indicator proves out for 3 seconds when the key is turned to the ON or START position. The Central Junction Box (CJB) fuse 4 (10A) provides voltage to the light sensor/anti-theft indicator. If there is a PATS concern, this indicator either flashes rapidly or glows steadily (for more than 3 seconds) when the key is turned to the ON or the START position. PATS also flashes the anti-theft indicator every 2 seconds at key off to act as a visual theft deterrent.

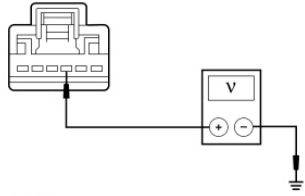
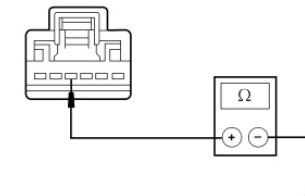
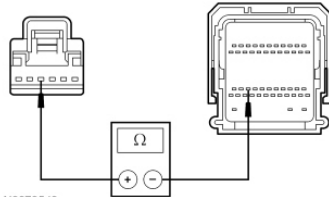
**This pinpoint test is intended to diagnose the following:**

- Fuse
- Anti-theft indicator
- Wiring, terminals or connectors
- PCM

**PINPOINT TEST F: THE ANTI-THEFT INDICATOR IS ALWAYS/NEVER ON**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take
<b>F1 CHECK THE ANTI-THEFT INDICATOR FOR CORRECT OPERATION</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175t.</li> <li>• Connect, then disconnect a fused jumper wire between the PCM C175t-32, circuit 1269 (OG/RD), harness side and ground.</li> </ul>  <p>N0079542</p> <ul style="list-style-type: none"> <li>• <b>Does the anti-theft indicator illuminate, then turn off?</b></li> </ul>	<p><b>Yes</b> GO to <u>F5</u> .</p> <p><b>No</b> GO to <u>F2</u> .</p>
<b>F2 CHECK THE VOLTAGE TO THE ANTI-THEFT INDICATOR</b>	
<ul style="list-style-type: none"> <li>• Disconnect: Light Sensor C287.</li> <li>• Measure the voltage between the light sensor C287-3, circuit 905 (VT/LB), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <u>F3</u> .</p> <p><b>No</b> VERIFY the CJB fuse 4 (10A) is OK. If OK, REPAIR the circuit. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of</p>

 <p>N0089988</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	the circuit short.
<b>F3 CHECK THE ANTI-THEFT INDICATOR GROUND CIRCUIT FOR A SHORT TO GROUND</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the light sensor C287-4, circuit 1269 (OG/RD), harness side and ground.</li> </ul>  <p>A0071679</p> <ul style="list-style-type: none"> <li>• Is the resistance greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <b>F4</b> .</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>F4 CHECK THE ANTI-THEFT INDICATOR GROUND CIRCUIT FOR AN OPEN</b>	
<ul style="list-style-type: none"> <li>• Measure the resistance between the light sensor C287-4, circuit 1269 (OG/RD), harness side, and the PCM C175t-32, circuit 1269 (OG/RD), harness side.</li> </ul>  <p>N0079543</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new light sensor. REFER to <a href="#">Section 417-01</a> . TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. TEST the system for normal operation.</p>
<b>F5 CHECK FOR CORRECT PCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect the PCM connector.</li> <li>• Check for:             <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect the PCM connector and make sure it seats correctly.</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <a href="#">Section 303-14</a> . PROGRAM the PATS keys into the PCM. REFER to <a href="#">Key Programming Using Diagnostic Equipment</a> in this section. TEST the system for normal operation.</p> <p><b>No</b></p>




<ul style="list-style-type: none"><li>• Operate the system and verify the concern is still present.</li><li>• <b>Is the concern still present?</b></li></ul>	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.
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**Key Programming Using Diagnostic Equipment**

## Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**NOTE:** This procedure is used when a customer needs keys programmed into the system and does not have 2 programmed ignition keys available. This procedure is also useful when a programmed ignition key(s) is lost or the ignition lock cylinder is replaced, and it is desired to erase key code(s) from the Passive Anti-Theft System (PATS) memory.

**NOTE:** This procedure erases all programmed ignition keys from the vehicle memory. The vehicle cannot start until a minimum of 2 keys are programmed into the PCM.

**NOTE:** Two PATS encoded (contains a transponder) keys with the correct mechanical cut must be available to carry out this procedure. One or both of them may be the customer's original keys.

**NOTE:** If additional keys are to be programmed, refer to Key Programming Using Two Programmed Keys in this section. If the remaining keys are with the customer and are not available with the vehicle, instruct the customer to refer to the Owner's Literature for instructions on programming the remaining keys. In this case, the PCM PID SPAREKEY must be set to ENABLE.

**NOTE:** This procedure is not necessary if only the PATS transceiver was replaced. Replacement of the transceiver does not erase the PATS key codes in the PCM.

1. Turn the key from the OFF position to the ON position.
2. From the scan tool, enter TOOLBOX. Select BODY - SECURITY - PATS Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to ENTER SECURITY ACCESS. For additional information, refer to Anti-Theft Security Access in this section.
3. From the scan tool menu select: "Ignition Key Code Erase". Follow all IDS screen instructions until the key erase procedure completes. The scan tool also instructs to program 2 keys to complete the process.
4. Turn the key to the OFF position and disconnect the scan tool (the key does not need to be removed at this time).
5. Turn the first PATS key in the ignition lock cylinder to the ON position for 3 seconds.
6. Turn the first PATS key to the OFF position and remove the key from the ignition lock cylinder.
7. Insert the second PATS key into the ignition lock cylinder and turn the key to the ON position for 3 seconds.
8. The vehicle should now start with both PATS ignition keys.

9. If it is desired to program additional key(s) (only up to 8 keys total can be programmed into the PCM), refer to Key Programming Using Two Programmed Keys in this section.
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**Key Programming Using Two Programmed Keys**

**NOTE:** This procedure works only if 2 or more programmed ignition keys are available. If 2 programmed keys are not available, refer to Key Programming Using Diagnostic Equipment in this section.

**NOTE:** The PCM PID SPAREKEY must be enabled for this procedure to operate. If this PID is not enabled, refer to Key Programming Switch State Control in this section, then select SPAREKEY programming switch ENABLED. The PCM PID SPAREKEY is set to ENABLE when the vehicle is built.

**NOTE:** If the programming procedure is successful, the new key(s) start the vehicle and the anti-theft indicator proves-out for approximately 3 seconds. If the programming procedure is not successful and the new key(s) does not start the engine, leave the key in the ON position for at least 3 seconds, then turn the key off. Repeat the key programming procedure from Step 1. If the failure repeats, refer to Anti-Theft in the Diagnosis and Testing portion of this section to review the DTCs and carry out the appropriate pinpoint tests.

**NOTE:** A maximum of 8 Passive Anti-Theft System (PATS) keys can be programmed into the PCM during this programming procedure, but only if the PID SPAREKEY is ENABLED.

**NOTE:** A minimum of 2 PATS keys must be programmed into the PCM before the vehicle starts.

**NOTE:** If the vehicle is in unlimited key mode, this spare key programming procedure still functions. Any 2 keys that can start the vehicle can be used to program an additional unlimited key.

**NOTE:** If additional keys are to be programmed, and the remaining keys are with the customer, or are not available, instruct the customer to refer to the Owner's Literature for instructions on programming the remaining keys. In this case, the PID SPAREKEY must be enabled.

**NOTE:** If the steps are not carried out as outlined, the programming procedure ends.

**NOTE:** Ignition keys must have a correct mechanical key cut for the vehicle and must be PATS encoded keys (contain a transponder).

**NOTE:** This procedure is not necessary if only the PATS transceiver was replaced. Replacement of the transceiver does not erase the PATS key codes in the PCM.

1. Insert the first programmed PATS key into the ignition lock cylinder and turn the key from the OFF position to the ON position (maintain the key in the ON position for a minimum of 3 seconds and less than 10 seconds).
2. Turn the first PATS key to the OFF position and remove the key from the ignition lock cylinder.
3. Within 5 seconds of turning the first key to the OFF position, insert the second programmed PATS key into the ignition lock cylinder and turn the key from the OFF position to the ON position (maintain the key in the ON position for a minimum of 3 seconds and less than 10 seconds).
4. Turn the second PATS key to the OFF position and remove the key from the ignition lock cylinder.
5. Within 10 seconds of turning the second PATS key to the OFF position, insert the unprogrammed PATS key (the new key) into the ignition lock cylinder and turn the key from the OFF position to the ON position (maintain the key in the ON position for a minimum of 3 seconds and less than 10


seconds). The new PATS key is now programmed.

6. If it is desired to program additional key(s) (only up to 8 keys total can be programmed into the PCM), repeat Steps 1 - 5 for each additional key that needs to be programmed.
  7. Start the vehicle with the new key(s).
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**Anti-Theft Security Access**

## Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**NOTE:** This procedure is used to obtain Passive Anti-Theft System (PATS) security access. PATS security access must be granted to erase ignition key codes, program ignition key codes, enable/disable unlimited key mode, set unlimited transponder key ID and enable/disable the spare key programming switch (PCM PID SPAREKEY). The anti-theft security access procedure invokes a 10-minute time delay prior to granting security access during which the scan tool must remain connected to the vehicle. Once security access is granted, a security access command menu is displayed, which offers various command options.

**NOTE:** Once security access has been granted, multiple security access commands should be executed (if necessary) prior to exiting the command menu. This avoids an additional security access procedure and the associated 10-minute time delay.


1. Turn the PATS key from the OFF position to the ON position.
  2. From the scan tool, enter TOOLBOX. Select BODY - SECURITY - PATS Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to ENTER SECURITY ACCESS. This procedure takes approximately 10 minutes to carry out, during which time the ignition switch must be in the ON position and the scan tool must be connected to the vehicle.
  3. After the 10-minute security access procedure is completed, follow the IDS on-screen instructions and a new menu is displayed with command options. Select only those functions required before exiting out of this menu. Do not select more functions than the procedure calls for or a PATS no-start may occur. Once exited out of this menu, the security access procedure must be repeated again to carry out additional commands.
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## Key Programming Switch State Control

### Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**NOTE:** The spare key programming switch is a programmable switch which provides the capability to enable/disable the normal customer spare key programming procedure detailed in the Owner's Literature. It must read ENABLE if more than 2 keys need to be programmed into the PCM. For additional information, refer to Key Programming Using Two Programmed Keys in this section. This programmable switch is provided as a convenience for rental company fleets or other fleet purchasers who may not want the Spare Key Programming procedure available to the vehicle driver.

**NOTE:** The spare key programming switch state can be viewed with the PCM PID SPAREKEY.

**NOTE:** If the PCM SPAREKEY PID reads ENABLE, up to 8 keys total can be programmed into the PCM. For additional information, refer to Key Programming Using Two Programmed Keys in this section. If the SPAREKEY PID reads DISABLE, the Key Programming Using Two Programmed Keys procedure will not function. This switch is set to ENABLE when the vehicle is built. This PID does not affect the Key Programming Using Diagnostic Equipment procedure or the Spare Key Programming - Unlimited Key Mode procedure or the Spare Key Programming - Using Diagnostic Equipment procedure.

1. Insert a programmed Passive Anti-Theft System (PATS) key into the ignition lock cylinder and turn the key from the OFF position to the ON position.
2. From the scan tool, enter TOOLBOX. Select BODY - SECURITY - PATS Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to ENTER SECURITY ACCESS. For additional information, refer to Anti-Theft Security Access in this section.
3. **NOTE:** The default setting on delivery of all new vehicles is ENABLE.

From the scan tool menu select: "Customer Spare Key Programming Enable" (or "Customer Spare Key Programming Disable") and follow the IDS on-screen instructions.

- "Customer Spare Key Programming Enable" - spare key programming procedure is accessible.
  - "Customer Spare Key Programming Disable" - spare key programming procedure is not accessible.
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**Spare Key Programming - Using Diagnostic Equipment**

## Special Tool(s)

	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**NOTE:** This procedure is used when a customer needs to have an additional key programmed into the vehicle without erasing stored key codes, but does not have 2 programmed keys available. This procedure is also useful when attempting to determine if an ignition key is damaged, as a new key can be programmed without erasing keys or without having 2 programmed keys available.

**NOTE:** Before programming, the new key must have the correct mechanical cut for the ignition lock cylinder.

**NOTE:** If 8 keys are already programmed, this procedure does not allow any more ignition keys to be programmed. The number of keys that are programmed into the Passive Anti-Theft System (PATS) can be determined by viewing the PCM PID N\_KEYCODE.

**NOTE:** If the vehicle is in unlimited key mode, this spare key programming procedure still functions. Any 2 keys that can start the vehicle can be used to program an additional unlimited key.

**NOTE:** When in the unlimited key mode (after the first 2 keys have been programmed to the vehicle), the N\_KEYCODE PID always reads 2, no matter how many keys are programmed to the vehicle.

1. Turn the unprogrammed PATS key from the OFF position to the ON position.
2. From the scan tool, enter TOOLBOX. Select BODY - SECURITY - PATS Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to ENTER SECURITY ACCESS. For additional information, refer to [Anti-Theft Security Access](#) in this section.
3. **NOTE:** Make sure the selection made is "Program additional ignition key". If the "Ignition Key Code Erase" selection is made, all of the keys are erased from the system.

From the scan tool menu select "Program additional ignition key" and follow the IDS on-screen instructions.

4. **NOTE:** The 20-second delay is to allow the PCM to exit the service mode.

Turn the PATS key to the OFF position and disconnect the scan tool (wait 20 seconds).


5. Start the vehicle with the new PATS key. The vehicle can now start with the new PATS key and also with the original PATS keys.



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**Spare Key Programming - Unlimited Key Mode**

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
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**Enabling Unlimited Key Mode**

**NOTE:** Unlimited key mode is intended for use by those customers who need more than 8 keys for their vehicle.

**NOTE:** Before programming, the new Passive Anti-Theft System (PATS) key(s) must have the correct mechanical cut for the ignition lock cylinder.

**NOTE:** The unlimited key mode is set up by creating a special, unique unlimited transponder security key code and programming this key code into all of the vehicle keys so they contain the same key code.

**NOTE:** When in the unlimited key mode (after the first 2 keys have been programmed to the vehicle), the N\_KEYCODE PID always reads 2, no matter how many keys are programmed to the vehicle.

1. The customer must choose an 8-digit number (except for 00000000 or 00000001) to be programmed into all of their vehicles keys (or, to all of the keys they want programmed to one vehicle). All customer vehicles keys (or all keys for one vehicle) need to use the same number. Valid digits are 0-9 and the letters A-F.
2. **NOTE:** If the PCM PID UNL\_KEY\_ID is not available, unlimited key mode is turned on, and must be turned off before viewing the stored code. At this time, unlimited keys may be programmed to the vehicle. To view/disable/change the stored code, follow the procedure for disabling the unlimited key mode below.

Monitor the PCM PID UNL\_KEY\_ID and compare its value against the code chosen in Step 1. It should not be the same key code.

3. From the scan tool, enter TOOLBOX. Select BODY - SECURITY - PATS Functions and follow the Integrated Diagnostic System (IDS) on-screen instructions to ENTER SECURITY ACCESS. For additional information, refer to Anti-Theft Security Access in this section.
4. Once in security access, select "program unlimited key code" and follow the IDS on-screen instructions. Enter the 8-digit code chosen by the customer in Step 1 of this procedure and follow the IDS on-screen instructions.
5. Select "unlimited key mode ON" and follow the IDS on-screen instructions.
6. Select "Ignition Key Code Erase" and follow the IDS on-screen instructions.

7. Disconnect the scan tool and turn the ignition key to the OFF position (the key does not need to be removed at this time).
8. Turn the first PATS key in the ignition lock cylinder to the ON position for 3 seconds.
9. Turn the first PATS key to the OFF position and remove the key from the ignition lock cylinder.
10. Insert the second PATS key into the ignition lock cylinder and turn the key to the ON position for 3 seconds. Both keys are now programmed and can start the vehicle.
11. If it is desired to program an additional key(s), refer to Key Programming Using Two Programmed Keys in this section for each additional key that needs to be programmed.

### Disabling Unlimited Key Mode

**NOTE:** By disabling the unlimited key mode, the previous access code no longer operates the vehicle.

1. From the scan tool, enter TOOLBOX. Select BODY - SECURITY - PATS Functions and follow the IDS on-screen instructions to ENTER SECURITY ACCESS. For additional information, refer to Anti-Theft Security Access in this section.
2. Select "unlimited key mode OFF" and follow the IDS on-screen instructions.
3. Select "Ignition Key Code Erase" and follow the IDS on-screen instructions.
4. Disconnect the scan tool and turn the ignition key to the OFF position (the key does not need to be removed at this time).
5. Turn the first PATS key in the ignition lock cylinder to the ON position for 3 seconds.
6. Turn the first PATS key to the OFF position and remove the key from the ignition lock cylinder.
7. Insert the second PATS key into the ignition lock cylinder and turn the key to the ON position for 3 seconds. Both keys are now programmed and can start the vehicle.
8. **NOTE:** With the unlimited key mode turned off, a maximum of 8 keys can be programmed into the PCM using the Key Programming Using Two Programmed Keys procedure in this section. The PCM PID SPAREKEY must be set to ENABLE.

If it is desired to program an additional key(s), refer to Key Programming Using Two Programmed Keys in this section for each additional key that needs to be programmed. The PCM PID SPAREKEY must be set to ENABLE.

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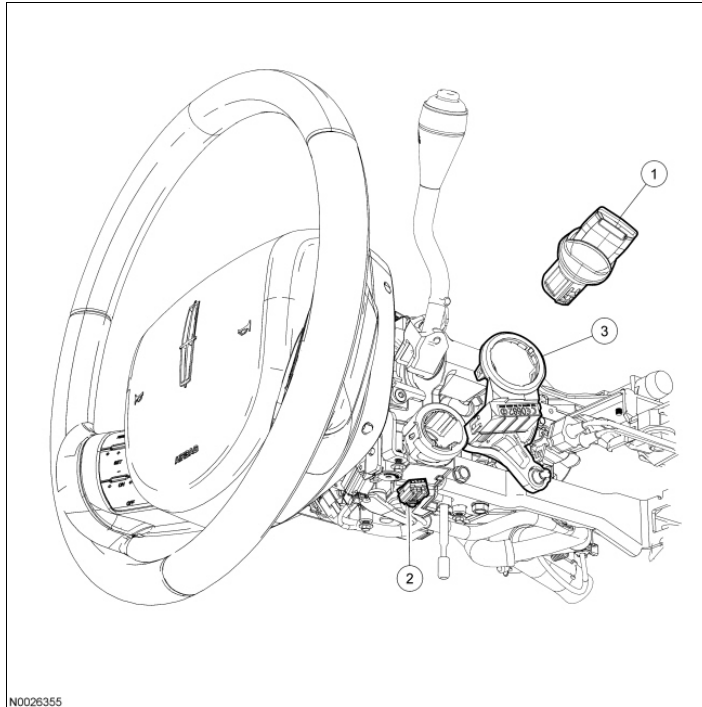


SECTION 419-01: Anti-Theft - Passive Anti-Theft  
System (PATS)

## REMOVAL AND INSTALLATION

2010 Crown Victoria, Grand Marquis  
Workshop Manual

Procedure revision date: 08/19/2009

**Passive Anti-Theft System (PATS) Transceiver**

Item	Part Number	Description
1	11582	Ignition lock cylinder
2	-	Passive Anti-Theft System (PATS) transceiver electrical connector (part of 14401)
3	15607	PATS transceiver

**Removal and Installation**

1. Remove the ignition lock cylinder. For additional information, refer to [Section 501-14](#).
2. Disconnect the electrical connector.
3. Using a suitable tool (such as a dentist pick), release the 2 tabs and remove the Passive Anti-Theft System (PATS) transceiver.
4. **NOTE:** Replacement of the PATS transceiver does not require the PATS keys to be programmed into the PCM again.

To install, reverse the removal procedure.





**Torque Specifications**

Description	Nm	lb-in
Speed control switch screw	7	62

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**Cruise Control**

The cruise control system consists of the following components:

- Cruise control switches
- Cruise control deactivator switch
- Cruise control indicator
- PCM
- Electronically-controlled throttle body




The cruise control system is controlled by the PCM. The cruise control system is designed to maintain a selected vehicle speed between 48 km/h (30 mph) to the maximum limited vehicle speed. The cruise control system is controlled by the steering wheel mounted switches (ON, OFF, SET+/SET- and RESUME), and the brake pedal. The steering wheel mounted switches are hardwired to the PCM.

During normal driving the vehicle speed may vary slightly from the set speed due to road conditions. The vehicle speed may fluctuate when driving up and down a steep hill. If the vehicle speed decreases more than 16 km/h (10 mph) below the set speed, the cruise control disengages.

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**Cruise Control**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

Pressing and releasing the steering wheel cruise control ON switch turns the cruise control system on. Pressing and releasing the SET+ or SET- switch while the vehicle is traveling at the desired speed activates the cruise control system.

Tapping the SET+ or the SET- switch while in the set mode, increases or decreases the maintained vehicle speed by 1.6 km/h (1 mph) per tap. If the respective switch is pressed and held, the vehicle speed continues to accelerate or decelerate until the switch is released.

Pressing and releasing the OFF switch, or turning the ignition switch to the OFF position, turns the cruise control system off. Pressing the brake pedal puts the cruise control system into the standby mode. Pressing the RESUME switch when the cruise control system is in the standby mode causes the vehicle to accelerate to the last set speed. The RESUME switch does not function if the OFF switch is pressed, the ignition switch is in the OFF position, or if the current vehicle speed is below the minimum operational speed.

Whenever the cruise control system is engaged and active, a cruise control icon on the Instrument Cluster (IC) is illuminated.

The cruise control deactivator switch is provided as an additional safety feature. Normally, when the brake pedal is applied, an electrical signal is sent from the stoplamp circuit to the ABS module. The PCM receives a serial message over the High Speed Controller Area Network (HS-CAN) from the ABS module. The serial message indicates that the brake pedal has been applied and the PCM releases the throttle. Under increased brake pedal effort, the cruise control deactivator switch opens and removes the voltage signal from the PCM input circuit, deactivating the cruise control system.

The clockspring provides the electrical interface between the steering column wiring and the cruise control switch(es) in the steering wheel.

The inputs to the PCM are the:

- Output Shaft Speed (OSS) sensor
- Digital Transmission Range (TR) sensor

- Cruise control switches
- Stoplamp switch
- Cruise control deactivator switch
- ABS module
- Accelerator pedal position sensors

The outputs of the PCM are the:

- Cruise control indicator lamp
- Throttle command

The cruise control system throttle position is completely controlled by the PCM through the electronically-controlled throttle body. Cruise control electronics are contained entirely within the Electronic Throttle Control (ETC) subsystem.

When the cruise control system is active, the PCM corrects for deviations in the actual vehicle speed by proportionally moving the throttle plate. The PCM modulates the throttle to minimize error between the actual vehicle speed and the desired speed.

The PCM strategy uses the throttle control for smooth accelerations.

The PCM sends a serial message over the HS-CAN to the IC whenever the cruise control indicator should be turned on or off.

In the event of an OFF command or a deactivation request from the cruise control deactivator switch, the cruise control system carries out a hard deactivation and immediately returns the throttle to the idle position.

The cruise control system provides self-diagnostics. Cruise control is disabled anytime an error is detected in the system. No IC indicator or message center messages are displayed when faults occur. Fault codes are logged by the PCM.

An ETC system fault also causes the cruise control system to be disabled. In this case, an ETC system warning indicator or a message center message is displayed.

Additionally, the following conditions cause the cruise control system to deactivate:

- Transmission gear selector in a position other than D or OD.
- Cruise control set speed is overridden with the accelerator pedal for a period longer than 5 minutes.
- Vehicle speed loss from set speed of greater than 16 km/h (10 mph) occurs.
- Vehicle speed falls below the minimum allowable limit of 48 km/h (30 mph).
- Cruise control switch pressed or stuck longer than 2 minutes.

### **Network Communication**

The following cruise control system components communicate via the HS-CAN :

- PCM
- ABS module
- IC

While there are numerous messages internal to the cruise control system modules, the following messages are utilized by the cruise control system in conjunction with outside systems:

**Module Communication Messages**

Broadcast Message	Originating Module	Network Type	Receiving Module
Brake switch status	ABS module	HS-CAN	PCM
Vehicle speed	PCM	HS-CAN	IC
Wheel speed sensor	ABS module	HS-CAN	PCM
Transmission selector (PRNDL) range	PCM	HS-CAN	IC
Cruise control Indicator request	PCM	HS-CAN	IC

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to [Section 100-02B](#) for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

**Visual Inspection Chart**

Electrical
<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 14 (20A)</li> <li>• Wiring, terminals or connectors</li> <li>• Stoplamp switch</li> <li>• Cruise control deactivator switch</li> <li>• PCM</li> <li>• Cruise control switches</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. Verify the stoplamps operate correctly with the ignition switch in the OFF position. If the stoplamps do not operate correctly, refer to [Section 417-01](#) .
5. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

6. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.

- Check the scan tool connection to the VCM .
  - Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.
7. If the scan tool does not communicate with the vehicle:
- Verify the ignition key is in the ON position.
  - Verify the scan tool operation with a known good vehicle.
  - Refer to Section 418-00 to diagnose no response from the PCM.
8. Carry out the network test.
- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
  - If the network test passes, retrieve and record the continuous memory DTCs.
9. Clear the continuous DTCs and carry out the self-test diagnostics for the PCM and ABS module.
10. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10 .
11. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### PCM DTC Chart

DTC	Description	Action
P0579	Cruise Control Multi-Function Input A Circuit Range/Performance	<u>GO to Pinpoint Test C</u> .
P0581	Cruise Control Multi-Function Input A Circuit High	<u>GO to Pinpoint Test C</u> .
P1572	Brake Pedal Switch Circuit	<u>GO to Pinpoint Test B</u> .
P1703	Brake Switch Out of Self Test Range	<u>GO to Pinpoint Test B</u> .

## Symptom Chart

### Symptom Chart

### Pinpoint Tests

#### Pinpoint Test A: The Cruise Control is Inoperative

##### Normal Operation

A reference voltage is sent from the PCM to the steering wheel cruise control switches. When a switch is pressed, the voltage is routed through a specific resistor value for each function. The PCM provides the ground for the reference voltage to determine which control input function has been selected. When the brake pedal is applied, the PCM deactivates the cruise control, if engaged. When the brake pedal is applied the ABS module receives the stoplamp signal and sends a message over the High Speed Controller Area Network (HS-CAN) to the PCM to deactivate the cruise control, if engaged. The cruise control deactivator switch removes the voltage signal to the PCM when the brake pedal is firmly applied. This is a redundant signal to

the PCM.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- PCM not configured for cruise control
- Cruise control switches
- Stoplamp switch
- Digital Transmission Range (TR) sensor
- Vehicle speed signal
- PCM
- ABS module

**PINPOINT TEST A: THE CRUISE CONTROL IS INOPERATIVE**

Test Step	Result / Action to Take
<b>A1 VERIFY PCM CONFIGURATION</b>	
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: Programmable Parameters.</li> <li>• Verify that the cruise control is enabled in the PCM.</li> <li>• <b>Is the cruise control enabled?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">A2</a> .</p> <p><b>No</b> ENABLE the cruise control in the PCM using the scan tool programmable parameters menu. TEST the system for normal operation.</p>
<b>A2 CHECK FOR ABS MODULE DTCs</b>	
<ul style="list-style-type: none"> <li>• Review the recorded DTCs from the ABS module self-test.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 206-09</a> . REPAIR all ABS module DTCs and RETEST the system.</p> <p><b>No</b> GO to <a href="#">A3</a> .</p>
<b>A3 CHECK THE PCM FOR DTCs</b>	
<ul style="list-style-type: none"> <li>• Review the recorded PCM DTCs from the continuous and on-demand self-tests.</li> <li>• <b>Are any DTCs recorded?</b></li> </ul>	<p><b>Yes</b> REFER to DTC Charts in this section.</p> <p><b>No</b> GO to <a href="#">A4</a> .</p>
<b>A4 CHECK THE VEHICLE SPEED</b>	
<ul style="list-style-type: none"> <li>• Check for correct operation of the speedometer.</li> <li>• <b>Does the speedometer operate correctly?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">A5</a> .</p> <p><b>No</b> REFER to <a href="#">Section 413-01</a> to continue diagnosis of the speedometer.</p>

**A5 CHECK THE STOPLAMP SWITCH (BOO) AND BRAKE PRESSURE SWITCH (BPA) PIDs**

- Enter the following diagnostic mode on the scan tool: PCM DataLogger.
- Monitor the PCM PIDs BOO (brake pedal top travel) and BPA (brake pressure switch) while applying and releasing the brake pedal as follows:

Brake Pedal Position	BOO PID	BPA PID
Released	Off	Off
Applied lightly	On	Off
Applied firmly	On	On

- **Do the PID values agree with the brake pedal position?**

**Yes**GO to A6 .**No**GO to Pinpoint Test B .**A6 CHECK THE CRUISE CONTROL SWITCH**

- Enter the following diagnostic mode on the scan tool: PCM DataLogger.
- Press each cruise control switch button while monitoring the cruise control switch PID (SCCS).

Cruise Control Switch	SCCS PID Value
-	NONE Pressed
RESUME	RESUME
OFF	Off
ON	On
SET +	SET/+
SET -	SET/-

- **Does the PID value agree with the switch position?**

**Yes**GO to A7 .**No**

If only one switch does not display the correct PID value, INSTALL a new cruise control switch. REFER to Cruise Control Switch in this section. TEST the system for normal operation.

Otherwise, GO to Pinpoint Test C .**A7 MONITOR THE TR PID**

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: PCM DataLogger.
- Monitor the PCM PID (TR).
- Select DRIVE.
- **Does the PID value agree with the transmission range selector lever position?**

**Yes**GO to A8 .**No**REFER to Section 307-01 .**A8 CHECK FOR CORRECT PCM OPERATION**

- Disconnect all the PCM connectors.
- Check for:

**Yes**

INSTALL a new PCM. REFER to Section 303-14 .



<ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> <li>• Connect all the PCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p>If equipped with fire suppression system, GO to <u>A8</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p> <p>If equipped with fire suppression system, GO to <u>A9</u> .</p>
<b>A9 REPOWER THE FIRE SUPPRESSION SYSTEM</b>	
<p><b>⚠ WARNING: If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to <u>Section 100-02B</u> . Failure to follow these instructions may result in serious personal injury.</b></p> <ul style="list-style-type: none"> <li>• Verify that the fire suppression system is repowered. Refer to <u>Section 100-02B</u> .</li> <li>• <b>Is the fire suppression system repowered?</b></li> </ul>	<p><b>Yes</b> Fire suppression system repowering is complete.</p> <p><b>No</b> REFER to <u>Section 100-02B</u> .</p>

**Pinpoint Test B: DTC P1572 OR DTC P1703**

Refer to Wiring Diagrams Cell 31 , Cruise Control for schematic and connector information.

**Normal Operation**

When the brake pedal is applied, voltage is sent to the ABS module from the stoplamp switch. The PCM receives a serial message from the ABS module over the High Speed Controller Area Network (HS-CAN), indicating the brake pedal has been applied. The PCM releases the throttle and disable the cruise control system.

The cruise control deactivator switch interrupts the power signal to the PCM when the brake pedal is applied firmly. This is a redundant signal to the PCM.

- DTC P1572 (Brake Pedal Switch Circuit) - sets when the PCM does not sense the correct sequence of the brake pedal input signal from both the cruise control deactivator and stoplamp switches when the brake pedal is pressed and released.
- DTC P1703 (Brake Switch Out Of Self Test Range) - sets when there is an open or short in the deactivator switch circuits or when there is an open or short in the stoplamp circuits.

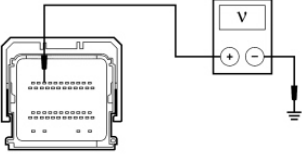
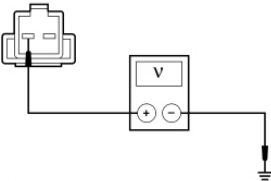
**This pinpoint test is intended to diagnose the following:**

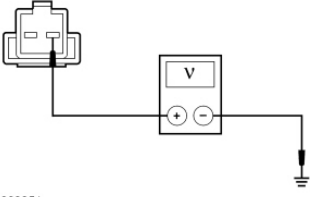
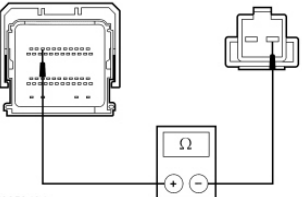
- Fuse
- Wiring, terminals or connectors
- Stoplamp switch
- Cruise control deactivator switch
- PCM

**PINPOINT TEST B: DTC P1572 OR DTC P1703**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take												
<b>B1 CHECK THE OPERATION OF THE STOPLAMPS</b>													
<ul style="list-style-type: none"><li>• Ignition ON.</li><li>• Operate the stoplamps.</li><li>• <b>Do the stoplamps operate correctly?</b></li></ul>	<p><b>Yes</b> GO to <b>B2</b> .</p> <p><b>No</b> REFER to <u>Section 417-01</u> .</p>												
<b>B2 CHECK THE STOPLAMP SWITCH (BOO_ABS) PID</b>													
<ul style="list-style-type: none"><li>• Enter the following diagnostic mode on the scan tool: ABS Module DataLogger.</li><li>• Monitor the ABS module PID (BOO_ABS).</li><li>• Apply and release the brake pedal.</li><li>• <b>Does the PID values display OFF with the brake pedal released and ON with the brake pedal applied?</b></li></ul>	<p><b>Yes</b> GO to <b>B3</b> .</p> <p><b>No</b> REFER to <u>Section 206-09</u> .</p>												
<b>B3 CHECK THE STOPLAMP SWITCH (BOO) AND BRAKE PRESSURE SWITCH (BPA) PIDs</b>													
<ul style="list-style-type: none"><li>• Enter the following diagnostic mode on the scan tool: PCM DataLogger.</li><li>• Monitor the PCM PIDs BOO (brake pedal top travel) and BPA (brake pressure switch) while applying and releasing the brake pedal as follows:</li></ul> <table border="1"><thead><tr><th>Brake Pedal Position</th><th>BOO PID</th><th>BPA PID</th></tr></thead><tbody><tr><td>Released</td><td>Off</td><td>Off</td></tr><tr><td>Applied lightly</td><td>On</td><td>Off</td></tr><tr><td>Applied firmly</td><td>On</td><td>On</td></tr></tbody></table> <ul style="list-style-type: none"><li>• <b>Do the PID values agree with the brake pedal position?</b></li></ul>	Brake Pedal Position	BOO PID	BPA PID	Released	Off	Off	Applied lightly	On	Off	Applied firmly	On	On	<p><b>Yes</b> GO to <b>B8</b> .</p> <p><b>No</b> GO to <b>B4</b> .</p>
Brake Pedal Position	BOO PID	BPA PID											
Released	Off	Off											
Applied lightly	On	Off											
Applied firmly	On	On											
<b>B4 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH FOR CORRECT OPERATION</b>													

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175b.</li> <li>• While firmly applying and releasing the brake pedal, measure the voltage between the PCM C175b-9, circuit 636 (OG), harness side and ground.</li> </ul>  <p>N0053500</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts with the brake pedal released and 0 volts with the brake pedal firmly applied?</li> </ul>	<p><b>Yes</b> GO to <b>B8</b> .</p> <p><b>No</b> GO to <b>B5</b> .</p>
<p><b>B5 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Cruise Control Deactivator Switch C277.</li> <li>• Measure the voltage between the cruise control deactivator switch C277-1, circuit 1119 (RD), harness side and ground.</li> </ul>  <p>N0053186</p> <ul style="list-style-type: none"> <li>• Is the voltage greater than 10 volts?</li> </ul>	<p><b>Yes</b> GO to <b>B6</b> .</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.</p>
<p><b>B6 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH CIRCUIT FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Measure the voltage between the cruise control deactivator switch C277-2, circuit 636 (OG), harness side and ground.</li> </ul>	<p><b>Yes</b> REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> GO to <b>B7</b> .</p>

 <p>N0002251</p> <p>• Is any voltage present?</p>	
<p><b>B7 CHECK THE CRUISE CONTROL DEACTIVATOR SWITCH CIRCUIT FOR AN OPEN</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Measure the resistance between the PCM C175b-9, circuit 636 (OG), harness side and the cruise control deactivator switch C277-2, circuit 636 (OG), harness side.</li> </ul>  <p>N0053494</p> <p>• Is the resistance less than 5 ohms?</p>	<p><b>Yes</b> INSTALL a new cruise control deactivator switch. REFER to <u>Cruise Control Deactivator Switch</u> in this section. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit. CLEAR the DTCs. TEST the system for normal operation.</p>
<p><b>B8 CHECK FOR CORRECT PCM OPERATION</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect all the PCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the PCM connectors and make sure they are seated correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

### Pinpoint Test C: The Cruise Control Switches Do Not Operate Correctly

Refer to Wiring Diagrams Cell 31 , Cruise Control for schematic and connector information.

#### Normal Operation

A reference voltage is sent from the PCM to the steering wheel cruise control switches. When a switch is pressed, the voltage is routed through a specific resistor value for each function. The PCM provides the ground for the reference voltage to determine which control input function has been selected. When the brake pedal is applied, the PCM deactivates the cruise control, if engaged.

- DTC P0579 (Cruise Control Multifunction Input A Circuit Range/Performance) - sets when the cruise control switch circuits are open, shorted to voltage or ground.

- DTC P0581 (Cruise Control Multi-Function Input A Circuit High) - sets when the cruise control switch circuits are open or shorted to voltage.

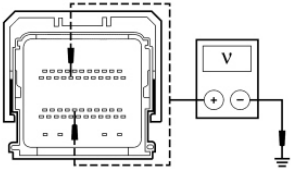
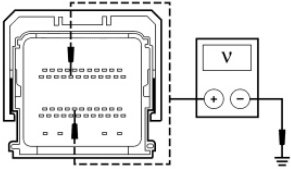
**This pinpoint test is intended to diagnose the following:**

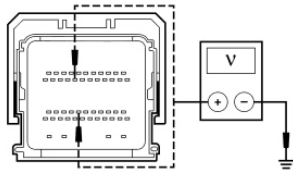
- Wiring, terminals or connectors
- Cruise control switches
- Clockspring
- PCM

#### PINPOINT TEST C: THE CRUISE CONTROL SWITCHES DO NOT OPERATE CORRECTLY

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

Test Step	Result / Action to Take														
<b>C1 CHECK THE CRUISE CONTROL SWITCH</b>															
<ul style="list-style-type: none"> <li>• Enter the following diagnostic mode on the scan tool: PCM DataLogger.</li> <li>• Press each cruise control switch button while monitoring the cruise control switch PID (SCCS).</li> </ul> <table border="1"> <thead> <tr> <th>Cruise Control Switch</th><th>SCCS PID Value</th></tr> </thead> <tbody> <tr> <td>-</td><td>NONE Pressed</td></tr> <tr> <td>RESUME</td><td>RESUME</td></tr> <tr> <td>OFF</td><td>Off</td></tr> <tr> <td>ON</td><td>On</td></tr> <tr> <td>SET +</td><td>SET/+</td></tr> <tr> <td>SET -</td><td>SET/-</td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>• Does the PID value agree with the switch position?</li> </ul>	Cruise Control Switch	SCCS PID Value	-	NONE Pressed	RESUME	RESUME	OFF	Off	ON	On	SET +	SET/+	SET -	SET/-	<p><b>Yes</b> GO to <u>C12</u> .</p> <p><b>No</b> If only one switch does not display the correct PID value, INSTALL a new cruise control switch. REFER to <u>Cruise Control Switch</u> in this section. TEST the system for normal operation.</p> <p>Otherwise, GO to <u>C2</u> .</p>
Cruise Control Switch	SCCS PID Value														
-	NONE Pressed														
RESUME	RESUME														
OFF	Off														
ON	On														
SET +	SET/+														
SET -	SET/-														
<b>C2 CHECK THE CRUISE CONTROL SWITCH CIRCUITS FOR A SHORT TO VOLTAGE</b>															
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: PCM C175b.</li> <li>• Ignition ON.</li> <li>• Turn the parking lamps on.</li> <li>• Measure the voltage between the PCM C175b-19, circuit 151 (LB/BK), harness side and ground; and between the PCM C175b-30, circuit 848 (DG/OG), harness side and ground.</li> </ul>	<p><b>Yes</b> TURN the parking lamps off. GO to <u>C3</u> .</p> <p><b>No</b> TURN the parking lamps off. GO to <u>C6</u> .</p>														

 <p>A0082239</p> <p>• Is any voltage present?</p>	
<p><b>C3 CHECK THE CRUISE CONTROL SWITCH CIRCUITRY FOR A SHORT TO VOLTAGE WITH THE CLOCKSPRING DISCONNECTED</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Clockspring C218a.</li> <li>• Ignition ON.</li> <li>• Turn the parking lamps on.</li> <li>• Measure the voltage between the PCM C175b-19, circuit 151 (LB/BK), harness side and ground; and between the PCM C175b-30, circuit 848 (DG/OG), harness side and ground.</li> </ul>  <p>A0082239</p> <p>• Is any voltage present?</p>	<p><b>Yes</b> REPAIR the circuit(s) in question. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> TURN the parking lamps off. GO to <u>C4</u> .</p>
<p><b>C4 CHECK THE CLOCKSPRING FOR A SHORT TO VOLTAGE</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Connect: Clockspring C218a.</li> <li>• <b>⚠ WARNING: Make sure no one is in the vehicle and there is nothing blocking or placed in front of any air bag module when the battery is connected. Failure to follow these instructions may result in serious personal injury in the event of an accidental deployment.</b></li> <li>• Remove the driver air bag module. Refer to <u>Section 501-20B</u> .</li> <li>• Disconnect: Clockspring C218b.</li> <li>• Connect the battery.</li> <li>• Ignition ON.</li> <li>• Turn the parking lamps on.</li> <li>• Measure the voltage between the PCM C175b-19, circuit 151 (LB/BK), harness side and ground; and between the PCM C175b-30, circuit 848 (DG/OG), harness side and ground.</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. INSTALL the driver air bag module. REFER to <u>Section 501-20B</u> . CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> GO to <u>C5</u> .</p>



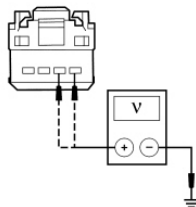
A0082239

- Is any voltage present?

### C5 CHECK THE STEERING WHEEL HARNESS FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Connect: Clockspring C218b.
- Disconnect: Cruise Control Switch(es).
- Ignition ON.
- Turn the parking lamps on.
- If equipped with remote audio/climate control switches, measure the voltage between the cruise control switch, harness side and ground as follows:

Cruise Control Switch	Circuit
C203-1	151 (LB/BK)
C203-2	848 (DG/OG)



N0107426

- If not equipped with remote audio/climate control switches, measure the voltage between the cruise control switch, harness side and ground as follows:

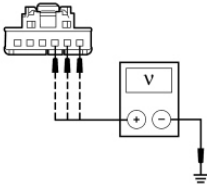
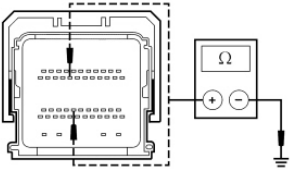
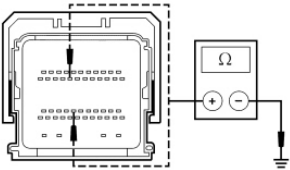
Cruise Control Switch	Circuit
C2330a-1	151 (LB/BK)
C2330a-2	131 (VT/OG)
C2330a-3	848 (DG/OG)

#### Yes

INSTALL a new steering wheel. REFER to [Section 211-04](#) . CLEAR the DTCs. TEST the system for normal operation.

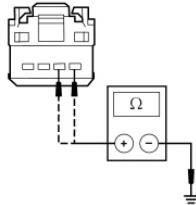
#### No

INSTALL new cruise control switch(es). REFER to [Cruise Control Switch](#) in this section. DISCONNECT the battery. INSTALL the driver air bag module. REFER to [Section 501-20B](#) . CLEAR the DTCs. TEST the system for normal operation.

 <p>N0107449</p> <ul style="list-style-type: none"> <li>• Is any voltage present?</li> </ul>	
<p><b>C6 CHECK THE CRUISE CONTROL CIRCUITRY FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Remove the driver air bag module. Refer to <a href="#">Section 501-20B</a>.</li> <li>• Disconnect: Clockspring C218b.</li> <li>• Measure the resistance between the PCM C175b-19, circuit 151 (LB/BK), harness side and ground; and between the PCM C175b-30, circuit 848 (DG/OG), harness side and ground.</li> </ul>  <p>A0082240</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> GO to <a href="#">C8</a>.</p> <p><b>No</b> GO to <a href="#">C7</a>.</p>
<p><b>C7 CHECK THE CLOCKSPRING FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Clockspring C218a.</li> <li>• Measure the resistance between the PCM C175b-19, circuit 151 (LB/BK), harness side and ground; and between the PCM C175b-30, circuit 848 (DG/OG), harness side and ground.</li> </ul>  <p>A0082240</p> <ul style="list-style-type: none"> <li>• Are the resistances greater than 10,000 ohms?</li> </ul>	<p><b>Yes</b> INSTALL a new clockspring. INSTALL the driver air bag module. REFER to <a href="#">Section 501-20B</a>. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> REPAIR the circuit(s) in question. CLEAR the DTCs. TEST the system for normal operation.</p>
<p><b>C8 CHECK THE CRUISE CONTROL SWITCH FOR A SHORT TO GROUND</b></p>	
<ul style="list-style-type: none"> <li>• Disconnect: Cruise Control Switch(es).</li> <li>• If equipped with remote audio/climate control switches, measure the resistance between the cruise control switch, harness side and ground as follows:</li> </ul>	<p><b>Yes</b> GO to <a href="#">C9</a>.</p> <p><b>No</b> INSTALL a new steering wheel. REFER to <a href="#">Section 211-04</a>. CLEAR the DTCs. TEST the system for normal</p>



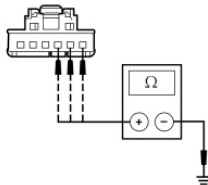
Cruise Control Switch	Circuit
C203-1	151 (LB/BK)
C203-2	848 (DG/OG)



N0090303

- If not equipped with remote audio/climate control switches, measure the resistance between the cruise control switch, harness side and ground as follows:

Cruise Control Switch	Circuit
C2330a-1	151 (LB/BK)
C2330a-2	131 (VT/OG)
C2330a-3	848 (DG/OG)

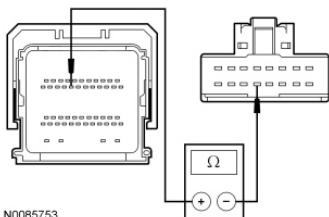


N0107450

- Are the resistances greater than 10,000 ohms?

### C9 CHECK THE CRUISE CONTROL SWITCH CIRCUITY FOR AN OPEN

- Disconnect: Clockspring C218a.
- Measure the resistance between the PCM C175b-19, circuit 151 (LB/BK), harness side and the clockspring C218a-13, circuit 151 (LB/BK), harness side.



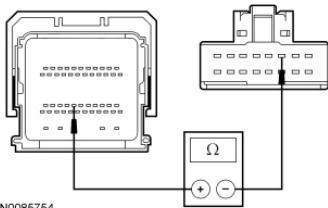
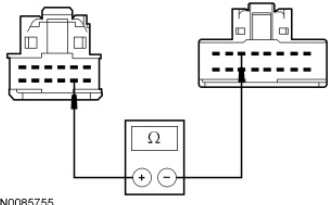
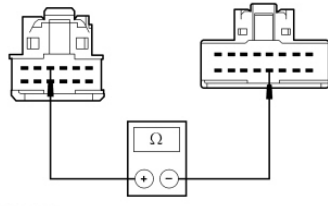
N0085753

- Measure the resistance between the PCM C175b-30, circuit 848 (DG/OG), harness side and the clockspring C218a-3, circuit 848

operation.

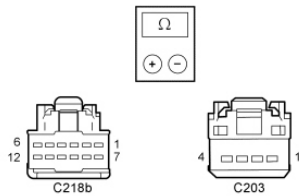
**Yes**  
GO to C10 .

**No**  
REPAIR the circuit in question. CLEAR the DTCs. TEST the system for normal operation.

(DG/OG), harness side.			
<div><p>N0085754</p></div> <ul style="list-style-type: none"><li>• Are the resistances less than 5 ohms?</li></ul>			
C10 CHECK THE CLOCKSPrING			
<ul style="list-style-type: none"><li>• Remove the driver air bag module. Refer to <u>Section 501-20B</u> .</li><li>• Disconnect: Clockspring C218b.</li><li>• Measure the resistance between the clockspring C218b pin 11, component side and the clockspring C218a pin 3, component side.</li></ul> <div><p>N0085755</p></div> <ul style="list-style-type: none"><li>• Measure the resistance between the clockspring C218b pin 3, component side and the clockspring C218a pin 13, component side.</li></ul> <div><p>N0085756</p></div> <ul style="list-style-type: none"><li>• Are the resistances less than 5 ohms?</li></ul>			<p><b>Yes</b> GO to <u>C11</u> .</p> <p><b>No</b> INSTALL a new clockspring. INSTALL the driver air bag module. REFER to <u>Section 501-20B</u> . CLEAR the DTCs. TEST the system for normal operation.</p>
C11 CHECK THE STEERING WHEEL HARNESS			
<ul style="list-style-type: none"><li>• Disconnect: Cruise Control Switch(es).</li><li>• If equipped with remote audio/climate control switches, measure the resistance between the clockspring C218b, harness side and the cruise control switch C203, harness side as follows:</li></ul>			<p><b>Yes</b> INSTALL new cruise control switch(es). REFER to <u>Cruise Control Switch</u> in this section. CLEAR the DTCs. TEST the system for normal operation.</p> <p><b>No</b> INSTALL a new steering wheel. REFER to <u>Section</u></p>
Clockspring Connector-Pin	Cruise Control Switch Connector-Pin	Circuit	

C218b-3	C203-1	151 (LB/BK)
C218b-11	C203-2	848 (DG/OG)

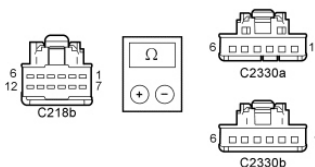
**211-04** . CLEAR the DTCs.  
TEST the system for normal operation.



N0107427

- If not equipped with remote audio/climate control switches, measure the resistance between the clockspring C218b, harness side and the cruise control switch, harness side as follows:

Clockspring Connector-Pin	Cruise Control Switch Connector-Pin	Circuit
C218b-3	C2330a-1	151 (LB/BK)
C218b-3	C2330b-6	151 (LB/BK)
C218b-11	C2330a-3	848 (DG/OG)
C218b-11	C2330b-4	848 (DG/OG)



N0107451

- **Are the resistances less than 5 ohms?**

#### **C12 CHECK FOR CORRECT PCM OPERATION**

- Connect: All Disconnected Connectors.
- Install the driver air bag module. Refer to [Section 501-20B](#) .
- Disconnect all the PCM connectors.
- Check for:
  - ◆ corrosion
  - ◆ damaged pins
  - ◆ pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.

**Yes**  
INSTALL a new PCM.  
REFER to [Section 303-14](#) .  
TEST the system for normal operation.

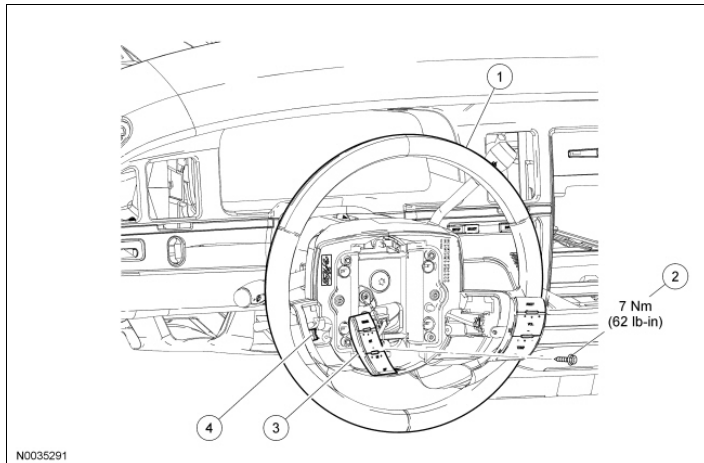
**No**  
The system is operating correctly at this time. The concern may have been

- Operate the system and verify the concern is still present.
- **Is the concern still present?**

caused by a loose or corroded connector.

## Cruise Control Switch

**NOTE:** Vehicles with remote audio/climate controls shown, vehicles without remote audio/climate controls similar.

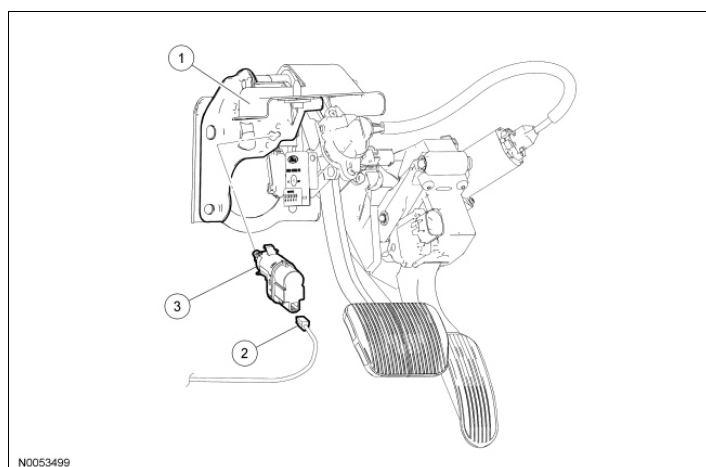


Item	Part Number	Description
1	3600	Steering wheel
2	-	Cruise control switch screw
3	9C888	Cruise control switch
4	-	Cruise control switch electrical connector (part of 3600)

### Removal and Installation

1. Remove the driver air bag module. For additional information, refer to [Section 501-20B](#) .
2. Remove the screw and the cruise control switch.
  - Disconnect the electrical connector.
  - To install, tighten to 7 Nm (62 lb-in).
3. To install, reverse the removal procedure.



**Cruise Control Deactivator Switch**

Item	Part Number	Description
1	2455	Brake pedal bracket
2	-	Cruise control deactivator switch electrical connector (part of 14A005)
3	9C872	Cruise control deactivator switch

**Removal**

**⚠ CAUTION:** The cruise control deactivator switch plunger must be manually depressed during removal to prevent damage to the switch.

1. Press down on the brake pedal to provide access to the cruise control deactivator switch plunger.
2. While holding the brake pedal down, push the cruise control deactivator switch plunger into the switch as far as possible, then rotate the switch 45 degrees counterclockwise and remove the cruise control deactivator switch. (The switch will rotate easily with the plunger depressed.)
3. Disconnect the cruise control deactivator switch electrical connector.

**Installation**

**NOTE:** The cruise control deactivator switch is self-adjusting and must be installed after the brake booster push rod and the brake pedal have been installed. Do not pull-up or push down on the brake pedal during the installation of the cruise control deactivator switch.

1. Install the cruise control deactivator switch, and rotate clockwise 45 degrees.
2. Connect the cruise control deactivator switch electrical connector.





**Module Controlled Functions**

The vehicle is equipped with the following multifunction modules:

- Driver Door Module (DDM)
- Lighting Control Module (LCM)

**Driver Door Module (DDM)**

The DDM monitors the inputs and provides outputs and diagnostic information for the following multiple vehicle systems, including the:

- Power door locks
- Remote Keyless Entry (RKE) system

The DDM monitors all of the door ajar switches as they are hardwired to the module. This door ajar information is sent through the Standard Corporate Protocol (SCP) network to the Instrument Cluster (IC), which sends the door ajar information to the Vehicle Dynamics Module (VDM) on the High Speed Controller Area Network (HS-CAN). Diagnostic information is retrieved from the DDM on the SCP communication network. The power door locks and the RKE system are all controlled by the DDM. The DDM also receives a hardwired input from the luggage compartment lid release switch and operates the luggage compartment lid release solenoid.

**Lighting Control Module (LCM)**

The LCM monitors the inputs and provides outputs and diagnostic information for the following multiple vehicle systems, including the:

- Battery saver and control backlighting
- Brake shift interlock
- Exterior lighting
- Interior lighting
- Perimeter alarm

The LCM receives a voltage input from the brake pedal position switch and provides power to the brake shift interlock solenoid. For the exterior lighting, the LCM receives inputs and provides outputs to control the exterior and interior (including the cluster and panel illumination) lighting systems on the vehicle.

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**Diagnostic Trouble Code (DTC) Chart**

**NOTE:** Most powertrain (P-code) DTCs are diagnosed in the Powertrain Control/Emissions Diagnosis (PC/ED) manual. If the P-code retrieved is not listed below, refer to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to continue diagnostics.

DTC	Description	Source	Action
B106A	TPMS Sensor Pressure Range Bit Incorrect State	Driver Door Module (DDM)	REFER to <a href="#">Section 204-04</a> .
B106B	Tire Pressure Sensor Low Battery	DDM	REFER to <a href="#">Section 204-04</a> .
B1148	Radio Frequency Power Output Circuit Short to Ground	DDM	REFER to <a href="#">Section 501-14</a> .
B1149	Radio Frequency Enable Output Circuit Short to Battery	DDM	REFER to <a href="#">Section 501-14</a> .
B1150	Radio Frequency Enable Output Circuit Short to Ground	DDM	REFER to <a href="#">Section 501-14</a> .
B1151	Radio Frequency AM/FM Signal Key Select Output Circuit Short to Ground	DDM	REFER to <a href="#">Section 501-14</a> .
B1152	Radio Frequency AM/FM Signal Key Select Output Circuit Short to Battery	DDM	REFER to <a href="#">Section 501-14</a> .
B1153	Police Wigwag Lighting Input Circuit Short to Ground	DDM	REFER to <a href="#">Section 417-01</a> .
B1202	Fuel Sender Circuit Open	Instrument Cluster (IC)	REFER to <a href="#">Section 413-01</a> .
B1204	Fuel Sender Circuit Short To Ground	IC	REFER to <a href="#">Section 413-01</a> .
B1205	EIC Switch-1 Assembly Circuit Failure	IC	REFER to <a href="#">Section 413-01</a> .
B1206	EIC Switch-1 Assembly Circuit Open	IC	REFER to <a href="#">Section 413-01</a> .
B1208	EIC Switch-1 Assembly Circuit Short To Ground	IC	REFER to <a href="#">Section 413-01</a> .
B1209	EIC Switch-2 Assembly Circuit Failure	IC	REFER to <a href="#">Section 413-01</a> .
B1210	EIC Switch-2 Assembly Circuit Open	IC	REFER to <a href="#">Section 413-01</a> .
B1212	EIC Switch-2 Assembly Circuit Short To Ground	IC	REFER to <a href="#">Section 413-01</a> .
B1213	Anti-Theft Number of Programmed Keys Is Below	PCM	REFER to <a href="#">Section 419-01</a> .

	Minimum		
B1231	Event Threshold Exceeded	Fire Suppression System Module (FSSM)	REFER to <a href="#">Section 100-02B</a> .
B1231	Event Threshold Exceeded	Restraints Control Module (RCM)	REFER to <a href="#">Section 501-20B</a> .
B1249	Blend Door Failure	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1251	Air Temperature Internal Sensor Circuit Open	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1253	Air Temperature Internal Sensor Circuit Short To Ground	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1255	Air Temperature External Sensor Circuit Open	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1257	Air Temperature External Sensor Circuit Short To Ground	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1260	Solar Radiation Sensor Circuit Short To Battery	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1261	Solar Radiation Sensor Circuit Short To Ground	HVAC module	REFER to <a href="#">Section 412-00</a> .
B1309	Power Door Lock Circuit Short To Ground	DDM	REFER to <a href="#">Section 501-14</a> .
B1317	Battery Voltage High	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B1317	Battery Voltage High	FSSM	REFER to <a href="#">Section 100-02B</a> .
B1317	Battery Voltage High	IC	REFER to <a href="#">Section 413-01</a> .
B1317	Battery Voltage High	RCM	REFER to <a href="#">Section 501-20B</a> .
B1317	Battery Voltage High	Vehicle Dynamics Module (VDM)	REFER to <a href="#">Section 204-05</a> .
B1318	Battery Voltage Low	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B1318	Battery Voltage Low	FSSM	REFER to <a href="#">Section 100-02B</a> .
B1318	Battery Voltage Low	IC	REFER to <a href="#">Section 413-01</a> .
B1318	Battery Voltage Low	RCM	REFER to <a href="#">Section 501-20B</a> .
B1318	Battery Voltage Low	VDM	REFER to <a href="#">Section 204-05</a> .
B1322	Driver Door Ajar Circuit Short To Ground	DDM	REFER to <a href="#">Section 417-02</a> .
B1334	Decklid Ajar Rear Door Circuit Short To Ground	Lighting Control Module (LCM)	REFER to <a href="#">Section 413-01</a> .
B1341	Power Door Unlock Circuit Short To Ground	DDM	REFER to <a href="#">Section 501-14</a> .
B1342	ECU Is Faulted	ABS module	REFER to <a href="#">Section 206-09</a> .
B1342	ECU Is Faulted	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B1342	ECU Is Faulted	FSSM	REFER to <a href="#">Section 100-02B</a> .
B1342	ECU Is Faulted	IC	REFER to <a href="#">Section 413-01</a> .

B1342	ECU Is Faulted	LCM	REFER to <u>Lighting Control Module (LCM)</u> in this section.
B1342	ECU Is Faulted	PCM	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new PCM. REFER to <u>Section 303-14</u> . TEST the system for normal operation.
B1342	ECU Is Faulted	RCM	REFER to <u>Section 501-20B</u> .
B1342	ECU Is Faulted	VDM	REFER to <u>Section 204-05</u> .
B1345	Heated Backlite Input Circuit Short To Ground	DDM	REFER to <u>Section 501-11</u> .
B1349	Heated Backlite Relay Short To Battery	DDM	REFER to <u>Section 501-11</u> .
B1352	Ignition Key-In Circuit Failure	LCM	REFER to <u>Section 413-01</u> .
B1359	Ignition Run/Acc Circuit Failure	LCM	REFER to <u>Section 211-05</u> .
B1396	Power Door Lock Circuit Short To Battery	DDM	REFER to <u>Section 501-14</u> .
B1397	Power Door Unlock Circuit Short To Battery	DDM	REFER to <u>Section 501-14</u> .
B1449	Wiper Park Sense Circuit Short To Ground	LCM	REFER to <u>Section 417-01</u> .
B1472	Lamp Headlamp Input Circuit Short To Ground	LCM	REFER to <u>Section 417-01</u> .
B1484	Brake Pedal Input Open Circuit	ABS module	REFER to <u>Section 206-09</u> .
B1485	Brake Pedal Input Short to Battery	LCM	REFER to <u>Section 307-05</u> .
B1520	Hood Switch Circuit Open	LCM	REFER to <u>Lighting Control Module (LCM)</u> in this section.
B1553	Decklid Release Circuit Short To Battery	DDM	REFER to <u>Section 501-14</u> .
B1555	Ignition Run/Start Circuit Failure	LCM	REFER to <u>Section 211-05</u> .
B1566	Door Ajar Circuit Short To Ground	DDM	REFER to <u>Section 417-02</u> .
B1566	Door Ajar Circuit Short To Ground	VDM	REFER to <u>Section 204-05</u> .
B1570	Lamp Headlamp High-Beam Circuit Short To Ground	LCM	REFER to <u>Section 417-01</u> .
B1578	Lamp Park Input Circuit Short To Ground	LCM	REFER to <u>Section 417-01</u> .
B1596	Service Continuous Codes	ABS module	REFER to <u>Section 206-09</u> .
B1600	PATS Ignition Key Transponder Signal Is Not Received	PCM	REFER to <u>Section 419-01</u> .
B1601	PATS Received Incorrect Key-Code From Ignition Key Transponder	PCM	REFER to <u>Section 419-01</u> .
B1602	PATS Received Invalid Format	PCM	REFER to <u>Section 419-01</u> .

	Of Key-Code From Ignition Key Transponder		
B1676	Battery Pack Voltage Out Of Range	ABS module	REFER to <a href="#">Section 206-09</a> .
B1676	Battery Pack Voltage Out Of Range	LCM	REFER to <a href="#">Lighting Control Module (LCM)</a> in this section.
B1681	PATS Transceiver Module Signal Is Not Received	PCM	REFER to <a href="#">Section 419-01</a> .
B1688	Lamp Dome Input Circuit Short To Ground	LCM	REFER to <a href="#">Section 417-02</a> .
B1696	Autolamp On Circuit Short To Ground	LCM	REFER to <a href="#">Section 417-01</a> .
B1869	Lamp Air Bag Warning Indicator Circuit Open	RCM	REFER to <a href="#">Section 501-20B</a> .
B1870	Lamp Air Bag Warning Indicator Circuit Short To Battery	RCM	REFER to <a href="#">Section 501-20B</a> .
B1873	Turn Signal / Hazard Power Feed Circuit Short To Ground	LCM	REFER to <a href="#">Section 417-01</a> .
B1884	PAD Warning Lamp Circuit Failure	RCM	REFER to <a href="#">Section 501-20B</a> .
B1890	PAD Warning Lamp Circuit Short to Battery	RCM	REFER to <a href="#">Section 501-20B</a> .
B1891	Air Bag Tone Warning Indicator Circuit Short to Battery	RCM	REFER to <a href="#">Section 501-20B</a> .
B1892	Air Bag Tone Warning Indicator Circuit Failure	RCM	REFER to <a href="#">Section 501-20B</a> .
B1921	Air Bag Diagnostic Monitor Ground Circuit Open	RCM	REFER to <a href="#">Section 501-20B</a> .
B2100	Door Driver Key Cylinder Switch Failure	LCM	REFER to <a href="#">Lighting Control Module (LCM)</a> in this section.
B2103	Antenna Not Connected	PCM	REFER to <a href="#">Section 419-01</a> .
B2108	Trunk Key Cylinder Switch Failure	LCM	REFER to <a href="#">Lighting Control Module (LCM)</a> in this section.
B2143	NVM Memory Failure	IC	REFER to <a href="#">Section 413-01</a> .
B2147	Driver Seat Switch Fault	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B2212	Panel Dim Switch Out of Range	LCM	REFER to <a href="#">Section 413-00</a> .
B2276	Less Than 2 Transmitters Programmed	DDM	REFER to <a href="#">Section 501-14</a> .
B2290	Occupant Classification System Fault	RCM	REFER to <a href="#">Section 501-20B</a> .
B2292	Restraint System - Seatbelt Pretensioner Fault	RCM	REFER to <a href="#">Section 501-20B</a> .
B2293	Restraint System - Airbag Fault	RCM	REFER to <a href="#">Section 501-20B</a> .
B2295	Restraint System - Side Airbag	RCM	REFER to <a href="#">Section 501-20B</a> .

## 2010 Crown Victoria, Grand Marquis Workshop Manual

	Fault		
B2296	Restraint System - Impact Sensor Fault	RCM	REFER to <a href="#">Section 501-20B</a> .
B2336	Mirror Switch Assembly Circuit Failure	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B2373	LED #1 Circuit Short to Battery	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B2425	Remote Keyless Entry Out of Synchronization	DDM	REFER to <a href="#">Section 501-14</a> .
B2431	Transponder Programming Failed	PCM	REFER to <a href="#">Section 419-01</a> .
B2432	Drivers Seat Belt Buckle Switch Circuit Open	RCM	REFER to <a href="#">Section 501-20B</a> .
B2433	Drivers Seat Belt Buckle Switch Circuit Short to Battery	RCM	REFER to <a href="#">Section 501-20B</a> .
B2434	Drivers Seat Belt Buckle Switch Circuit Short to Ground	RCM	REFER to <a href="#">Section 501-20B</a> .
B2435	Drivers Seat Belt Buckle Switch Resistance Out of Range	RCM	REFER to <a href="#">Section 501-20B</a> .
B2436	Passengers Seat Belt Buckle Switch Circuit Open	RCM	REFER to <a href="#">Section 501-20B</a> .
B2437	Passengers Seat Belt Buckle Switch Circuit Short to Battery	RCM	REFER to <a href="#">Section 501-20B</a> .
B2438	Passengers Seat Belt Buckle Switch Circuit Short to Ground	RCM	REFER to <a href="#">Section 501-20B</a> .
B2439	Passengers Seat Belt Buckle Switch Resistance Out of Range	RCM	REFER to <a href="#">Section 501-20B</a> .
B2477	Module Configuration Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
B2477	Module Configuration Failure	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B2477	Module Configuration Failure	FSSM	REFER to <a href="#">Section 100-02B</a> .
B2477	Module Configuration Failure	IC	REFER to <a href="#">Section 413-01</a> .
B2477	Module Configuration Failure	LCM	REFER to <a href="#">Lighting Control Module (LCM)</a> in this section.
B2477	Module Configuration Failure	RCM	REFER to <a href="#">Section 501-20B</a> .
B2477	Module Configuration Failure	VDM	REFER to <a href="#">Section 204-05</a> .
B2675	Trip Reset Button Stuck	IC	REFER to <a href="#">Section 413-01</a> .
B2695	Keypad_A Switch Circuit Failure	DDM	REFER to <a href="#">Section 501-14</a> .
B2696	Keypad_B Switch Circuit Failure	DDM	REFER to <a href="#">Section 501-14</a> .
B2697	Keypad_C Switch Circuit Failure	DDM	REFER to <a href="#">Section 501-14</a> .
B2718	Liftgate/Decklid Ajar Output Short to Battery	DDM	REFER to <a href="#">Section 501-14</a> .
B2792		FSSM	REFER to <a href="#">Section 100-02B</a> .

2010 Crown Victoria, Grand Marquis Workshop Manual

	Cross Link Between Firing Loops		
B2792	Cross Link Between Firing Loops	RCM	REFER to <a href="#">Section 501-20B</a> .
B2868	Left Front Tire Pressure Sensor Fault	DDM	REFER to <a href="#">Section 204-04</a> .
B2869	Right Front Tire Pressure Sensor Fault	DDM	REFER to <a href="#">Section 204-04</a> .
B2870	Right Rear Tire Pressure Sensor Fault	DDM	REFER to <a href="#">Section 204-04</a> .
B2871	Left Rear Tire Pressure Sensor Fault	DDM	REFER to <a href="#">Section 204-04</a> .
B2872	Tire Pressure Sensor Fault	DDM	REFER to <a href="#">Section 204-04</a> .
B287A	Tire Pressure System Fault	DDM	REFER to <a href="#">Section 204-04</a> .
B2885	Spare Tire Pressure Sensor Fault	DDM	REFER to <a href="#">Driver Door Module (DDM)</a> in this section.
B2900	VIN Mismatch	ABS module	REFER to <a href="#">Section 206-09</a> .
B2900	VIN Mismatch	FSSM	REFER to <a href="#">Section 100-02B</a> .
B2909	Belt Tension Sensor Fault	RCM	REFER to <a href="#">Section 501-20B</a> .
B299A	Suppressor Left Circuit Open - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B299B	Suppressor Left Circuit Short to Battery - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B299C	Suppressor Left Circuit Short to Ground - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B299E	Suppressor Left Circuit Resistance Low on Squib - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B299F	Suppressor Left Circuit Open - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A0	Suppressor Left Circuit Short to Battery - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A1	Suppressor Left Circuit Short to Ground - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A3	Suppressor Left Circuit Resistance Low on Squib - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A4	Suppressor Right Circuit Open - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A5	Suppressor Right Circuit Short to Battery - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A6	Suppressor Right Circuit Short to Ground - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A8	Suppressor Right Circuit Resistance Low on Squib - Loop #1	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29A9	Suppressor Right Circuit Open - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .



## 2010 Crown Victoria, Grand Marquis Workshop Manual

B29AA	Suppressor Right Circuit Short to Battery - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29AB	Suppressor Right Circuit Short to Ground - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29AD	Suppressor Right Circuit Resistance Low on Squib - Loop #2	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29AE	Fire Suppression Manual Activation Switch Closed At Key On	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29AF	Fire Suppression Manual Activation Switch High Side Circuit Failure	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29B0	Fire Suppression Manual Activation Switch High Side Circuit Short to Battery	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29B1	Fire Suppression Manual Activation Switch Low Side Circuit Failure	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29B2	Fire Suppression Manual Activation Switch Low Side Circuit Short to Ground	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29B3	Fire Suppression Indicator Lamp Circuit Failure	FSSM	REFER to <a href="#">Section 100-02B</a> .
B29B4	Fire Suppression Indicator Lamp Circuit Short to Battery	FSSM	REFER to <a href="#">Section 100-02B</a> .
C1145	Speed Wheel Sensor RF Input Circuit Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
C1155	Speed Wheel Sensor LF Input Circuit Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
C1165	Speed Wheel Sensor RR Input Circuit Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
C1175	Speed Wheel Sensor LR Input Circuit Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
C1222	Speed Wheel Mismatch	ABS module	REFER to <a href="#">Section 206-09</a> .
C1266	ABS Valve Power Relay Circuit Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
C1296	Wheel Speed LF Signal Fault	ABS module	REFER to <a href="#">Section 206-09</a> .
C1297	Wheel Speed RF Signal Fault	ABS module	REFER to <a href="#">Section 206-09</a> .
C1298	Wheel Speed RR Signal Fault	ABS module	REFER to <a href="#">Section 206-09</a> .
C1299	Wheel Speed LR Signal Fault	ABS module	REFER to <a href="#">Section 206-09</a> .
C1300	ABS Pump Motor Circuit Failure	ABS module	REFER to <a href="#">Section 206-09</a> .
C1414	Incorrect Module Design Level	RCM	REFER to <a href="#">Section 501-20B</a> .
C1724	Air Suspension Height Sensor Power Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1726	Air Suspension Rear Pneumatic Failure	VDM	REFER to <a href="#">Section 204-05</a> .

## 2010 Crown Victoria, Grand Marquis Workshop Manual

C1770	Air Suspension Vent Solenoid Output Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1790	Air Suspension LR Air Spring/Shock Solenoid Output Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1795	Air Suspension RR Air Spring/Shock Solenoid Output Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1805	Mismatched PCM and/or ABS-TC Module	ABS module	REFER to <a href="#">Section 206-09</a> .
C1830	Air Suspension Compressor Relay Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1840	Air Suspension Disable Switch Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1885	Air Suspension RR Height Sensor Circuit Failure	VDM	REFER to <a href="#">Section 204-05</a> .
C1946	Front Driver's Seat Track Position Switch Circuit Open	RCM	REFER to <a href="#">Section 501-20B</a> .
C1947	Front Driver's Seat Track Position Switch Circuit Short to Ground	RCM	REFER to <a href="#">Section 501-20B</a> .
C1948	Front Driver's Seat Track Position Switch Circuit Resistance Out of Range	RCM	REFER to <a href="#">Section 501-20B</a> .
C1964	Air Susp'n Air Compressor Request Exceeded Max Timing	VDM	REFER to <a href="#">Section 204-05</a> .
C1982	Front Driver's Seat Track Position Switch Circuit Short to Battery	RCM	REFER to <a href="#">Section 501-20B</a> .
C2780	ECU in Manufacturer Sub-State	DDM	REFER to <a href="#">Section 204-04</a> .
P0532	A/C Refrigerant Pressure Sensor A Circuit Low	PCM	REFER to <a href="#">Section 412-00</a> .
P0533	A/C Refrigerant Pressure Sensor A Circuit High	PCM	REFER to <a href="#">Section 412-00</a> .
P0563	System Voltage High	PCM	REFER to <a href="#">Section 414-00</a> .
P0579	Cruise Control Multi-Function Input A Circuit Range/Performance	PCM	REFER to <a href="#">Section 419-03</a> .
P0581	Cruise Control Multi-Function Input A Circuit High	PCM	REFER to <a href="#">Section 419-03</a> .
P0602	Powertrain Control Module Programming Error	PCM	REFER to <a href="#">Section 418-01</a> .
P0605	Internal Control Module Read Only Memory ( ROM ) Error	PCM	REFER to <a href="#">Section 418-01</a> .
P0620	Generator Control Circuit	PCM	REFER to <a href="#">Section 414-00</a> .
P0625	Generator Field Terminal Circuit Low	PCM	REFER to <a href="#">Section 414-00</a> .
P0626		PCM	REFER to <a href="#">Section 414-00</a> .

	Generator Field Terminal Circuit High		
P0630	VIN Not Programmed or Incompatible - ECM /PCM	FSSM	REFER to <a href="#">Section 100-02B</a> .
P0645	A/C Clutch Relay Control Circuit	PCM	REFER to <a href="#">Section 412-00</a> .
P065B	Generator Control Circuit Range/Performance	PCM	REFER to <a href="#">Section 414-00</a> .
P0705	Transmission Range Sensor A Circuit (PRNDL Input)	PCM	REFER to <a href="#">Section 307-01</a> .
P0708	Transmission Range Sensor A Circuit High	PCM	REFER to <a href="#">Section 307-01</a> .
P0712	Transmission Fluid Temperature Sensor A Circuit Low	PCM	REFER to <a href="#">Section 307-01</a> .
P0713	Transmission Fluid Temperature Sensor A Circuit High	PCM	REFER to <a href="#">Section 307-01</a> .
P0715	Turbine/Input Shaft Speed Sensor A Circuit	PCM	REFER to <a href="#">Section 307-01</a> .
P0717	Turbine/Input Shaft Speed Sensor A Circuit No Signal	PCM	REFER to <a href="#">Section 307-01</a> .
P0718	Turbine/Input Shaft Speed Sensor A Circuit Intermittent	PCM	REFER to <a href="#">Section 307-01</a> .
P0720	Output Shaft Speed Sensor Circuit	PCM	REFER to <a href="#">Section 307-01</a> .
P0721	Output Shaft Speed Sensor Circuit Range/Performance	PCM	REFER to <a href="#">Section 307-01</a> .
P0722	Output Shaft Speed Sensor Circuit No Signal	PCM	REFER to <a href="#">Section 307-01</a> .
P0731	Gear 1 Incorrect Ratio	PCM	REFER to <a href="#">Section 307-01</a> .
P0732	Gear 2 Incorrect Ratio	PCM	REFER to <a href="#">Section 307-01</a> .
P0733	Gear 3 Incorrect Ratio	PCM	REFER to <a href="#">Section 307-01</a> .
P0734	Gear 4 Incorrect Ratio	PCM	REFER to <a href="#">Section 307-01</a> .
P0740	Torque Converter Clutch Solenoid Circuit / Open	PCM	REFER to <a href="#">Section 307-01</a> .
P0741	Torque Converter Clutch Solenoid Circuit Performance Or Stuck Off	PCM	REFER to <a href="#">Section 307-01</a> .
P0743	Torque Converter Clutch Solenoid Circuit Electrical	PCM	REFER to <a href="#">Section 307-01</a> .
P0748	Pressure Control Solenoid A Electrical	PCM	REFER to <a href="#">Section 307-01</a> .
P0750	Shift Solenoid A	PCM	REFER to <a href="#">Section 307-01</a> .
P0753	Shift Solenoid A Electrical	PCM	REFER to <a href="#">Section 307-01</a> .
P0755	Shift Solenoid B	PCM	REFER to <a href="#">Section 307-01</a> .
P0758	Shift Solenoid B Electrical	PCM	REFER to <a href="#">Section 307-01</a> .
P0781	1-2 Shift	PCM	REFER to <a href="#">Section 307-01</a> .

P0782	2-3 Shift	PCM	REFER to <a href="#">Section 307-01</a> .
P0783	3-4 Shift	PCM	REFER to <a href="#">Section 307-01</a> .
P0960	Pressure Control Solenoid A Control Circuit / Open	PCM	REFER to <a href="#">Section 307-01</a> .
P0962	Pressure Control Solenoid A Control Circuit Low	PCM	REFER to <a href="#">Section 307-01</a> .
P0963	Pressure Control Solenoid A Control Circuit High	PCM	REFER to <a href="#">Section 307-01</a> .
P1116	Engine Coolant Temperature Sensor Out Of Self Test Range	PCM	REFER to <a href="#">Section 307-01</a> .
P1124	Throttle Position Sensor A Out Of Self Test Range	PCM	REFER to <a href="#">Section 307-01</a> .
P1260	Theft Detected, Vehicle Immobilized	PCM	REFER to <a href="#">Section 419-01</a> .
P1460	Wide Open Throttle A/C Cutout Circuit	PCM	REFER to <a href="#">Section 307-01</a> .
P1464	A/C Demand Out Of Self Test Range	PCM	REFER to <a href="#">Section 412-00</a> .
P1572	Brake Pedal Switch Circuit	PCM	REFER to <a href="#">Section 419-03</a> .
P1636	Inductive Signature Chip Communication Error	PCM	REFER to <a href="#">Section 307-01</a> .
P1639	Vehicle ID Block Corrupted, Not Programmed	PCM	REFER to <a href="#">Section 418-01</a> .
P1702	Transmission Range Sensor Circuit Intermittent	PCM	REFER to <a href="#">Section 307-01</a> .
P1703	Brake Switch Out Of Self Test Range	PCM	REFER to <a href="#">Section 307-01</a> .
P1704	Transmission Range Circuit Not Indicating Park/Neutral During Self Test	PCM	REFER to <a href="#">Section 307-01</a> .
P1705	Transmission Range Circuit Not Indicating Park/Neutral During Self Test	PCM	REFER to <a href="#">Section 307-01</a> .
P1711	Transmission Fluid Temperature Sensor Out Of Self Test Range	PCM	REFER to <a href="#">Section 307-01</a> .
P1713	Transmission Fluid Temperature Sensor In Range Failure (â 50 deg F)	PCM	REFER to <a href="#">Section 307-01</a> .
P1714	Shift Solenoid A Inductive Signature	PCM	REFER to <a href="#">Section 307-01</a> .
P1715	Shift Solenoid B Inductive Signature	PCM	REFER to <a href="#">Section 307-01</a> .
P1718	Transmission Fluid Temperature Sensor In Range Failure (>250 deg F)	PCM	REFER to <a href="#">Section 307-01</a> .
P1728	Transmission Slip	PCM	REFER to <a href="#">Section 307-01</a> .
P1740	Torque Converter Clutch Solenoid Inductive Signature	PCM	REFER to <a href="#">Section 307-01</a> .

## 2010 Crown Victoria, Grand Marquis Workshop Manual




P1741	Torque Converter Clutch Solenoid Control Error	PCM	REFER to <a href="#">Section 307-01</a> .
P1742	Torque Converter Clutch Solenoid Circuit Failed On	PCM	REFER to <a href="#">Section 307-01</a> .
P1743	Torque Converter Clutch Solenoid Circuit Failed On	PCM	REFER to <a href="#">Section 307-01</a> .
P1744	Torque Converter Clutch Solenoid Circuit Performance	PCM	REFER to <a href="#">Section 307-01</a> .
P1746	Pressure Control Solenoid A Open Circuit	PCM	REFER to <a href="#">Section 307-01</a> .
P1747	Pressure Control Solenoid A Short Circuit	PCM	REFER to <a href="#">Section 307-01</a> .
P1760	Pressure Control Solenoid A Short Circuit Intermittent	PCM	REFER to <a href="#">Section 307-01</a> .
P1780	Transmission Control Switch (O/D Cancel) Circuit Out Of Self Test Range	PCM	REFER to <a href="#">Section 307-01</a> .
P1783	Transmission Overtemperature Condition	PCM	REFER to <a href="#">Section 307-01</a> .
PXXXX	All other DTCs	PCM	REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
U0073	Control Module Communication Bus A Off	ABS module	REFER to <a href="#">Section 418-00</a> .
U0073	Control Module Communication Bus A Off	VDM	REFER to <a href="#">Section 418-00</a> .
U0100	Lost Communication With ECM /PCM	ABS module	REFER to <a href="#">Section 206-09</a> .
U0100	Lost Communication With ECM /PCM	VDM	REFER to <a href="#">Section 204-05</a> .
U0155	Lost Communication With Instrument Panel Cluster ( IC ) Control Module	VDM	REFER to <a href="#">Section 204-05</a> .
U0300	Internal Control Module Software Incompatibility	PCM	REFER to <a href="#">Section 418-01</a> .
U1039	SCP (J1850) Invalid Or Missing Data For Primary ID \$27	PCM	REFER to <a href="#">Section 417-01</a> .
U1073	SCP (J1850) Invalid or Missing Data for Engine Coolant	HVAC module	REFER to <a href="#">Section 412-00</a> .
U1262	SCP (J1850) Communication Bus Fault	IC	REFER to <a href="#">Section 418-00</a> .
U1341	SCP (J1850) Invalid or Missing Data for Function Read Vehicle Speed	HVAC module	REFER to <a href="#">Section 412-00</a> .
U1900	CAN Communication Bus Fault - Receive Error	FSSM	REFER to <a href="#">Section 418-00</a> .
U1900	CAN Communication Bus Fault - Receive Error	IC	REFER to <a href="#">Section 418-00</a> .
U2011		VDM	REFER to <a href="#">Section 204-05</a> .

# 2010 Crown Victoria, Grand Marquis Workshop Manual

	Module Transmitted Invalid Data (Non SCP )		
U2023	Fault Received From External Node	IC	REFER to <u>Section 413-01</u> .
U2050	No Application Present	ABS module	REFER to <u>Section 206-09</u> .
U2050	No Application Present	DDM	REFER to <u>Driver Door Module (DDM)</u> in this section.
U2050	No Application Present	IC	REFER to <u>Section 413-01</u> .
U2050	No Application Present	PCM	REFER to <u>Section 418-01</u> .
U2050	No Application Present	VDM	REFER to <u>Section 204-05</u> .
U2051	One or More Calibration Files Missing / Corrupt	PCM	REFER to <u>Section 418-01</u> .

**Driver Door Module (DDM)**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The Driver Door Module (DDM) monitors all of the hardwired door ajar switches. This door ajar information is provided to the Instrument Cluster (IC) using the Standard Corporate Protocol (SCP) network. The IC acts as a gateway to translate the information and sends it to the Vehicle Dynamics Module (VDM), if equipped, using the High Speed Controller Area Network (HS-CAN). Diagnostic information is also retrieved from the DDM on the SCP network.

The power door locks and the Remote Keyless Entry (RKE) system are all controlled by the DDM . The DDM also receives an input from the luggage compartment lid release switch and operates the luggage compartment lid release solenoid.

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

**Visual Inspection Chart**

Electrical
<ul style="list-style-type: none"> <li>• Battery Junction Box (BJB) fuse 8 (20A)</li> </ul>

- Central Junction Box (CJB) fuse 2 (7.5A)
- Wiring, terminals or connectors
- Driver Door Module (DDM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:
  - Verify the ignition key is in the ON position.
  - Verify the scan tool operation with a known good vehicle.
  - Refer to Section 418-00 to diagnose no response from the PCM.
7. Carry out the network test.
  - If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
  - If the network test passes, retrieve and record the continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the DDM .
9. If the DTCs retrieved are related to the concern, go to DTC Charts.
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### Driver Door Module (DDM) DTC Chart

DTC	Description	Action
B1317	Battery Voltage High	<u>GO to Pinpoint Test A</u> .
B1318	Battery Voltage Low	<u>GO to Pinpoint Test B</u> .
B1342	ECU Is Faulted	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new DDM . REFER to <u>Driver Door Module (DDM)</u> in this section. TEST the system for normal operation.
B2147	Driver Seat Switch Fault	DISREGARD the DTC. It is not applicable to this vehicle. CLEAR the DTCs. REPEAT the self-test.
B2336	Mirror Switch Assembly Circuit	DISREGARD the DTC. It is not applicable to this vehicle. CLEAR the DTCs. REPEAT the self-test.



	Failure	
B2373	LED #1 Circuit Short to Battery	DISREGARD the DTC. It is not applicable to this vehicle. CLEAR the DTCs. REPEAT the self-test.
B2477	Module Configuration Failure	REFER to <u>Section 418-01</u> .
B2885	Spare Tire Pressure Sensor Fault	DISREGARD the DTC. It is not applicable to this vehicle as it is not equipped with a spare tire pressure sensor. CLEAR the DTCs. REPEAT the self-test.
U2050	No Application Present	CONFIGURE the DDM . REFER to <u>Section 418-01</u> . CLEAR the DTCs. REPEAT the self-test. If DTC U2050 is retrieved again, INSTALL a new DDM . REFER to <u>Driver Door Module (DDM)</u> in this section. TEST the system for normal operation.
All other DTCs	-	REFER to <u>Diagnostic Trouble Code (DTC) Chart</u> in this section.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test A: DTC B1317

Refer to Wiring Diagrams Cell 13 , Power Distribution/SJB for schematic and connector information.

#### Normal Operation

The Driver Door Module (DDM) monitors the voltage from the battery to determine if it goes above or below specific thresholds and sets DTC B1317 in continuous memory and on-demand if the DDM detects high battery voltage above 16 volts on circuit 1213.

- DTC B1317 (Battery Voltage High) - a continuous memory or an on-demand DTC that sets when the DDM detects battery voltage above 16 volts on circuit 1213.

**This pinpoint test is intended to diagnose the following:**

- Charging system concern
- DDM

### PINPOINT TEST A: DTC B1317

**NOTE:** DTC B1317 may be stored in the module memory due to previous battery charging or vehicle jump starting events.

Test Step	Result / Action to Take
-----------	-------------------------

<b>A1 CHECK FOR DTC B1317, B1676 OR P0563 SET IN OTHER MODULES</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: (All CMDTCs) Self-Test.</li> <li>• Retrieve the continuous memory DTCs from all modules.</li> <li>• <b>Is DTC B1317, B1676 or P0563 (PCM) set in more than one module?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 414-00</u> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <u>A2</u> .</p>
<b>A2 CHECK THE BATTERY VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Turn off all interior/exterior lights and accessories.</li> <li>• Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage.</li> <li>• <b>Does the battery voltage rise to 15.5 volts or higher?</b></li> </ul>	<p><b>Yes</b> REFER to <u>Section 414-00</u> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <u>A3</u> .</p>
<b>A3 RECHECK FOR DTC B1317</b>	
<ul style="list-style-type: none"> <li>• Turn the engine off.</li> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: DDM Self-Test.</li> <li>• Clear the continuous memory DTCs.</li> <li>• Carry out the DDM self-test.</li> <li>• <b>Is DTC B1317 present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Driver Door Module (DDM)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating normally at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.</p>

**Pinpoint Test B: DTC B1318**

Refer to Wiring Diagrams Cell 13 , Power Distribution/SJB for schematic and connector information.

**Normal Operation**

The Driver Door Module (DDM) monitors the voltage from the battery to determine if it goes above or below specific thresholds and sets DTC B1318 in continuous memory and on-demand if the DDM detects low battery voltage below 10 volts on circuit 1213.

- DTC B1318 (Battery Voltage Low) - a continuous memory or an on-demand DTC that sets when the DDM detects battery voltage below 10 volts on circuit 1213.

**This pinpoint test is intended to diagnose the following:**

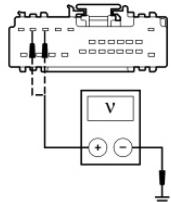
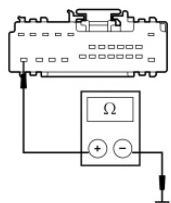
- Wiring, terminals or connectors
- High circuit resistance
- DDM

**PINPOINT TEST B: DTC B1318**

**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .




Test Step	Result / Action to Take
<b>B1 RECHECK THE DDM DTCs</b>	
<ul style="list-style-type: none"> <li>Ignition ON.</li> <li>Enter the following diagnostic mode on the scan tool: DDM Self-Test.</li> <li>Clear the DTCs. Repeat the DDM self-test.</li> <li><b>Is DTC B1318 still present?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">B2</a> .</p> <p><b>No</b> The system is operating normally at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.</p>
<b>B2 CHECK FOR CHARGING SYSTEM DTCs IN THE PCM</b>	
<ul style="list-style-type: none"> <li>Enter the following diagnostic mode on the scan tool: PCM Self-Test.</li> <li>Retrieve the continuous memory DTCs from the PCM.</li> <li><b>Is DTC P0620, P0625, P0626 or P065B set in the PCM?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> .</p> <p><b>No</b> GO to <a href="#">B3</a> .</p>
<b>B3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE</b>	
<ul style="list-style-type: none"> <li>Ignition OFF.</li> <li>Check the battery condition and verify the battery is fully charged. Refer to <a href="#">Section 414-01</a> .</li> <li><b>Is the battery OK and fully charged?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">B4</a> .</p> <p><b>No</b> REFER to <a href="#">Section 414-00</a> .</p>
<b>B4 CHECK THE DDM VOLTAGE SUPPLY</b>	
<ul style="list-style-type: none"> <li>Measure and record the voltage at the battery.</li> <li>Disconnect: DDM C501B.</li> <li>Ignition ON.</li> <li>Measure the voltage between the DDM C501B-10, circuit 1213 (WH/LB), harness side and ground; and between the DDM C501B-11, circuit 1213 (WH/LB), harness side and ground.</li> </ul>	<p><b>Yes</b> GO to <a href="#">B5</a> .</p> <p><b>No</b> REPAIR the circuit for high resistance. CLEAR the DTCs. REPEAT the self-test.</p>

 <p>N0090014</p> <ul style="list-style-type: none"> <li>• Are the voltages within 0.2 volt of the recorded battery voltage?</li> </ul>	
<b>B5 CHECK THE DDM GROUND CIRCUIT</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the DDM C501B-24, circuit 57 (BK), harness side and ground.</li> </ul>  <p>N0088149</p> <ul style="list-style-type: none"> <li>• Is the resistance less than 5 ohms?</li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>B6</u> .</p> <p><b>No</b> REPAIR the circuit in question for high resistance. CONNECT the negative battery cable. TEST the system for normal operation.</p>
<b>B6 CHECK FOR CORRECT DDM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the DDM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the DDM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• Is the concern still present?</li> </ul>	<p><b>Yes</b> INSTALL a new DDM . REFER to <u>Driver Door Module (DDM)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>



**Lighting Control Module (LCM)**

## Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST2574-A	Flex Probe Kit 300-NUD105-R025DE or equivalent

**Principles of Operation**

The Lighting Control Module (LCM) controls several vehicle subsystems. Diagnostic information is retrieved from the LCM on the Standard Corporate Protocol (SCP) network. The LCM responds to electrical input signals from various switches, sensors, and external modules. The LCM is located under the LH side of the instrument panel. Subsystem functions of the LCM include:

- Battery saver and control backlighting
- Brake shift interlock
- Exterior lighting
- Interior lighting

**Inspection and Verification**

**⚠ WARNING:** If equipped with fire suppression system, refer to Section 100-02B for Important Safety Warnings. Failure to follow this instruction may result in serious personal injury.

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

**Visual Inspection Chart**

Electrical
<ul style="list-style-type: none"> <li>• Central Junction Box (CJB) fuse(s):     ♦ 5 (7.5A)</li> </ul>

- ◆ 6 (10A)
- ◆ 26 (10A)
- ◆ 31 (5A)
- Wiring, terminals or connectors
- Lighting Control Module (LCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .

If the scan tool does not communicate with the VCM :

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM .
- Refer to Section 418-00 , No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to Section 418-00 to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to Section 418-00 .
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the LCM .

9. If the DTCs retrieved are related to the concern, refer to Diagnostic Trouble Code (DTC) Chart in this section.

10. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

## DTC Charts

### Lighting Control Module (LCM) DTC Chart

DTC	Description	Action
B1342	ECU Is Faulted	CLEAR the DTCs. REPEAT the self-test. If DTC B1342 is retrieved again, INSTALL a new Lighting Control Module (LCM). REFER to <u>Lighting Control Module (LCM)</u> in this section. TEST the system for normal operation.
B1520	Hood Switch Circuit Open	DISREGARD the DTC. It is not applicable to this vehicle as it is not equipped with a hood switch. CLEAR the DTCs. REPEAT the self-test.

B1676	Battery Pack Voltage Out Of Range	GO to <u>Pinpoint Test C</u> .
B2100	Door Driver Key Cylinder Switch Failure	DISREGARD the DTC. It is not applicable to this vehicle as it is not equipped with a driver door key cylinder switch. CLEAR the DTCs. REPEAT the self-test.
B2108	Trunk Key Cylinder Switch Failure	DISREGARD the DTC. It is not applicable to this vehicle as it is not equipped with a trunk key cylinder switch. CLEAR the DTCs. REPEAT the self-test.
B2477	Module Configuration Failure	REFER to <u>Section 418-01</u> .
All other DTCs	-	REFER to the <u>Diagnostic Trouble Code (DTC) Chart</u> in this section.

## Symptom Chart

Symptom Chart

## Pinpoint Tests

### Pinpoint Test C: DTC B1676

Refer to Wiring Diagrams Cell 13 , Power Distribution/SJB for schematic and connector information.

#### Normal Operation

The Lighting Control Module (LCM) monitors the voltage from the battery to determine if it goes above or below specific thresholds and sets DTC B1676 in continuous memory and on-demand if the LCM detects battery voltage out of range for at least 2 minutes on circuit 221.

- DTC B1676 (Battery Pack Voltage Out Of Range) - a continuous memory or an on-demand DTC that sets when the LCM detects battery voltage out of range for at least 2 minutes. A minimum of (+/-) 24 seconds must elapse before this DTC is recorded. Battery voltage is out of range if it is less than 8.5 volts (+/- 1.0V) or greater than 17 volts (+/-1.5V).

**This pinpoint test is intended to diagnose the following:**

- Charging system concern
- LCM

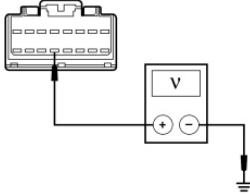
#### PINPOINT TEST C: DTC B1676

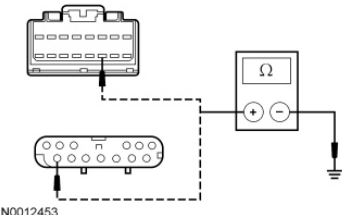
**NOTICE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

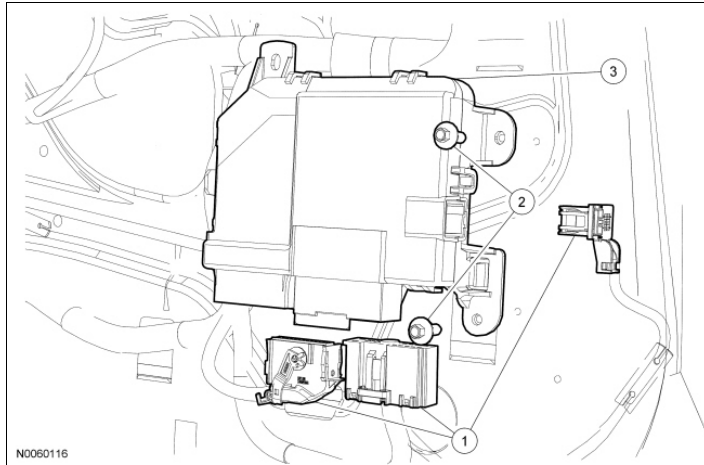
**NOTE:** DTC B1676 may be stored in the module memory due to previous battery charging or vehicle jump starting events.



**NOTE:** Failure to disconnect the battery when instructed will result in false resistance readings. Refer to [Section 414-01](#) .

Test Step	Result / Action to Take
<b>C1 CHECK FOR CHARGING SYSTEM DTCs SET IN OTHER MODULES</b>	
<ul style="list-style-type: none"> <li>• Ignition ON.</li> <li>• Enter the following diagnostic mode on the scan tool: (All CMDTCs) Self-Test.</li> <li>• Retrieve the continuous memory DTCs from all modules.</li> <li>• <b>Are charging system DTCs set in more than one module?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <a href="#">C2</a> .</p>
<b>C2 CHECK THE BATTERY VOLTAGE</b>	
<ul style="list-style-type: none"> <li>• Turn off all interior/exterior lights and accessories.</li> <li>• Start and run the engine at approximately 2,000 rpm for 3 minutes while monitoring the battery voltage.</li> <li>• <b>Does the battery voltage rise to 15.5 volts or higher?</b></li> </ul>	<p><b>Yes</b> REFER to <a href="#">Section 414-00</a> to diagnose an overcharging condition.</p> <p><b>No</b> GO to <a href="#">C3</a> .</p>
<b>C3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE</b>	
<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Check the battery condition and verify the battery is fully charged. Refer to <a href="#">Section 414-01</a> .</li> <li>• <b>Is the battery OK and fully charged?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">C4</a> .</p> <p><b>No</b> REFER to <a href="#">Section 414-00</a> .</p>
<b>C4 CHECK THE LCM VOLTAGE SUPPLY</b>	
<ul style="list-style-type: none"> <li>• Disconnect: LCM C2145a.</li> <li>• Ignition ON.</li> <li>• Measure the voltage between the LCM C2154a-13, circuit 221 (OG/WH), harness side and ground.</li> </ul>  <p>N0026949</p> <ul style="list-style-type: none"> <li>• <b>Is the voltage within 0.2 volt of the recorded battery voltage?</b></li> </ul>	<p><b>Yes</b> GO to <a href="#">C5</a> .</p> <p><b>No</b> VERIFY the Central Junction Box (CJB) fuse 6 (7.5A) is OK. If OK, REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.</p>
<b>C5 CHECK THE LCM GROUND CIRCUITS FOR CONTINUITY</b>	

<ul style="list-style-type: none"> <li>• Ignition OFF.</li> <li>• Disconnect: LCM C2145c.</li> <li>• Disconnect: Negative Battery Cable.</li> <li>• Measure the resistance between the LCM C2154a-11, circuit 676 (PK/OG), harness side and ground; and between the LCM C2154c-7, circuit 676 (PK/OG), harness side and ground.</li> </ul>  <p>N0012453</p> <ul style="list-style-type: none"> <li>• <b>Are the resistances less than 5 ohms?</b></li> </ul>	<p><b>Yes</b> CONNECT the negative battery cable. GO to <u>C6</u> .</p> <p><b>No</b> REPAIR the circuit in question. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the self-test.</p>
<b>C6 CHECK FOR CORRECT LCM OPERATION</b>	
<ul style="list-style-type: none"> <li>• Disconnect all the LCM connectors.</li> <li>• Check for: <ul style="list-style-type: none"> <li>◆ corrosion</li> <li>◆ damaged pins</li> <li>◆ pushed-out pins</li> </ul> </li> <li>• Connect all the LCM connectors and make sure they seat correctly.</li> <li>• Operate the system and verify the concern is still present.</li> <li>• <b>Is the concern still present?</b></li> </ul>	<p><b>Yes</b> INSTALL a new LCM . REFER to <u>Lighting Control Module (LCM)</u> in this section. TEST the system for normal operation.</p> <p><b>No</b> The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.</p>

**Driver Door Module (DDM)**

Item	Part Number	Description
1	-	Driver Door Module (DDM) electrical connectors (part of 14A005)
2	56910	DDM screws (2 required)
3	13C791	DDM

**Removal**

**NOTICE:** Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

**NOTE:** Prior to the replacement of the Driver Door Module (DDM), it is necessary to upload the module configuration information to the scan tool. This information must be downloaded into the new DDM after installation. For additional information, refer to [Section 418-01](#) .

**NOTE:** The Tire Pressure Monitoring System (TPMS) functionality is integral to the DDM .

**NOTE:** The steps included in the DDM removal and installation procedure are critical to restoring the vehicle security and TPMS to normal operation. A new DDM is delivered in a manufacturing mode with 6 pre-set DTCs related to the TPMS . To clear the DTCs, successful configuration of the DDM must occur, followed by successful TPMS sensor training, and a successful self-test, including clearing of the DTCs. The DTCs are as follows:

- B2477 (Module Configuration Failure)
- B2868 (Left Front Tire Pressure Sensor Fault)
- B2869 (Right Front Tire Pressure Sensor Fault)
- B2870 (Right Rear Tire Pressure Sensor Fault)
- B2871 (Left Rear Tire Pressure Sensor Fault)
- C2780 ( ECU in Manufacturer Sub-State)

1. **NOTE:** This step is only necessary if a new DDM is being installed.

Upload the module configuration information from the DDM into the scan tool. For additional information, refer to [Section 418-01](#) .

2. Remove the driver door trim panel. For additional information, refer to [Section 501-05](#) .
3. Disconnect the DDM electrical connectors.
4. Remove the 2 screws.
5. Release the locking tab and remove the DDM .

### Installation

1. Position the DDM and engage the locking tab.
2. Install the 2 screws.
3. Connect the electrical connectors.
4. **NOTE:** If the DDM was not replaced, this is the last step that is necessary.

Install the driver door trim panel. For additional information, refer to [Section 501-05](#) .

5. **NOTE:** When successful, this step provides the calibration necessary for the DDM operation and clears DTC B2477. The clearing of this DTC indicates the calibration data has been successfully downloaded to the new DDM .

**NOTE:** The following steps are necessary only if the DDM is being replaced.

Download the DDM configuration information from the scan tool. For additional information, refer to [Section 418-01](#) .

6. **NOTE:** When successful, this step clears DTCs B2868, B2869, B2870 and B2871. The clearing of these DTCs indicates the DDM has recognized the tire pressure sensors during the training procedure.

Train the tire pressure sensors. For additional information, refer to [Section 204-04](#) .

7. **NOTE:** DTC C2780 does not clear if any other DTCs are present in the DDM . When successful, this step clears DTC C2780.

Carry out the DDM self-test (must include an on-demand self-test) by clearing DTCs, and then retrieving DTCs to confirm all DTCs have been cleared.



**Lighting Control Module (LCM)**

Item	Part Number	Description
1	-	Lighting Control Module (LCM) screws (2 required)
2	-	LCM electrical connectors (part of 14401)
3	13C788	LCM

**Removal and Installation**

**NOTE:** Prior to removal of the module, it is necessary to upload module configuration information to a scan tool. This information needs to be downloaded into the new module once installed. For additional information, refer to [Section 418-01](#) .

1. **NOTE:** This step is only necessary if a new Lighting Control Module (LCM) is being installed.

**NOTE:** A new LCM is delivered in a manufacturing mode with pre-set DTC B2477. This DTC clears when the module has been successfully configured (or Programmable Module Installation (PMI) is carried out). DTC B2477 may need to be cleared after a successful configuration (or PMI) .

Upload the module configuration information from the LCM into the scan tool. For additional information, refer to [Section 418-01](#) .

2. Remove the pin-type retainers and position the LH instrument panel lower insulator aside.
3. Disconnect the courtesy lamp and remove the LH instrument panel lower insulator.
4. Remove the accelerator pedal. For additional information, refer to [Section 310-02](#) .
5. Remove the 2 screws and position the LCM aside.

6. Release the locking tabs, disconnect the electrical connectors and remove the LCM .
7. **NOTE:** If a new module is installed, it is necessary to download the module configuration information from the scan tool into the new module. For additional information, refer to Section 418-01 .

To install, reverse the removal procedure.

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**2010 Crown Victoria, Grand Marquis  
Workshop Manual**

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**Quick Links**

[Introduction](#)

[Master DTC Chart](#)

[Specifications](#)

[Metrics](#)

[Torque Wrench Adapter Formulas](#)

[Acronyms](#)

[Alphabetical Index](#)

**Table of Contents**

1: General Information

[00: Service Information](#)

2: Chassis

[04: Suspension](#)

[05: Driveline](#)

[06: Brake System](#)

[11: Steering System](#)

3: Powertrain

[03: Engine](#)

[07: Automatic Transmission](#)

[09: Exhaust System](#)

[10: Fuel System](#)

4: Electrical

Lighting Control Module (LCM)



12: Climate Control System

13: Instrumentation and Warning Systems

14: Battery and Charging System

15: Audio Systems

17: Lighting

18: Electrical Distribution

19: Electronic Feature Group

5: Body and Paint

01: Body

02: Frame and Mounting

← [2010 Crown Victoria, Grand  
Marquis Contents/Index](#)

← [GROUP 00: Service Information](#)

---

**SECTION 100-01:**  
**Identification Codes**

---

DESCRIPTION AND OPERATION

Identification Codes

Vehicle Identification Number (VIN)

Vehicle Certification (VC) Label

Powertrain Calibration Information

← [2010 Crown Victoria, Grand  
Marquis Contents/Index](#)

← [GROUP 00: Service Information](#)

---

**SECTION 100-02A:**  
**Jacking and Lifting**

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DESCRIPTION AND OPERATION  
Jacking and Lifting

← [2010 Crown Victoria, Grand  
Marquis Contents/Index](#)

← [GROUP 00: Service Information](#)

---

**SECTION 100-02B:**  
**Fire Suppression System**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Fire Suppression System

DIAGNOSIS AND TESTING

Fire Suppression System

Principles of Operation

Inspection and Verification

DTC Charts

Symptom Chart

Pinpoint Tests

GENERAL PROCEDURES

Fire Suppression System Depowering and Repowering

REMOVAL AND INSTALLATION

Fire Suppression System Module (FSSM)

Fire Suppression Manifold

Fire Suppressor

Fire Suppression Manual Switch

- ← [2010 Crown Victoria, Grand Marquis Contents/Index](#)
- ← [GROUP 00: Service Information](#)

---

## SECTION 100-03: Maintenance Schedule

---

### DESCRIPTION AND OPERATION

[Maintenance Schedules - Gasoline Engines](#)

[General Maintenance Information](#)

[Engine Idle Hour Meter - Crown Victoria Police Interceptor, Taxi and Executive Series Town Car Equipped with Engine Idle Hour Meter](#)

[Special Operating Condition Requirements](#)

[Checks and Services](#)

[Multi-Point Inspection](#)

[Normal Schedule](#)

[Exceptions To Normal Schedule](#)

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 00: Service Information](#)

---

**SECTION 100-04:**  
**Noise, Vibration and Harshness**

---

DESCRIPTION AND OPERATION  
[Noise, Vibration and Harshness \(NVH\)](#)  
[Acceptable NVH](#)

[Glossary of Terms](#)

DIAGNOSIS AND TESTING

[Noise, Vibration and Harshness \(NVH\)](#)

[Diagnostic Theory](#)

[Diagnostic Procedure Overview](#)

[Tools and Techniques](#)

[Write-Up Job Aid](#)

[1: Customer Interview](#)

[2: Pre-Drive Check](#)

[3: Preparing for the Road Test](#)

[4: Verify the Customer Concern](#)

[5: Road Test](#)

[Slow Acceleration Test](#)

[Heavy Acceleration Test](#)

[Neutral Coast Down Speed Test](#)

[Downshift Speed Test](#)

[Steering Input Test](#)

[Brake Test](#)

[Road Test Over Bumps](#)

[Neutral Engine Run-Up \(NERU\) Test](#)

[Drive Engine Run-Up \(DERU\) Load Test](#)

[Engine Accessory Test](#)

Lighting Control Module (LCM)

Vehicle Cold Soak Procedure

Classify NVH Symptom

Noise Symptoms

Vibration Symptoms

Frequency Calculations

Calculating Tire and Wheel Frequency

Calculating Driveshaft Frequency

Calculating Engine Frequency

Calculating Engine Accessory Frequency

Calculating Engine Firing Frequency

Frequency and RPM Calculations Worksheet

Harshness Symptoms

Symptom Chart - Vehicle-Speed Related Vibrations

Symptom Chart - Tire-Speed Related Vibrations

Symptom Chart - Driveshaft-Speed Related Vibrations

Symptom Chart - Engine-Speed Related Vibrations

Symptom Chart - Noise, Air Leaks or Water Leaks

Symptom Chart - Harshness

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-00: Body System - General Information

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Insulation

##### Body Sealer Types And Applications

#### DIAGNOSIS AND TESTING

##### Body System

##### Inspection and Verification

##### Symptom Chart - NVH



← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

← [GROUP 01: Body](#)

---

**SECTION 501-02:  
Front End Body Panels**

---

SPECIFICATIONS

REMOVAL AND INSTALLATION

Fender Splash Shield - LH

Fender Splash Shield - RH

Fender

Radiator Grille Opening Panel

Cowl Panel Grille

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

← [GROUP 01: Body](#)

---

## SECTION 501-03: Body Closures

---

### SPECIFICATIONS

#### GENERAL PROCEDURES

Door Alignment - Front

Door Alignment - Rear

Luggage Compartment Lid Alignment

Striker Adjustment

Torsion Bar Loading

#### REMOVAL AND INSTALLATION

Door - Front

Door - Rear

Luggage Compartment Lid

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-05: Interior Trim and Ornamentation

---

### SPECIFICATIONS

### REMOVAL AND INSTALLATION

#### Interior Trim - Exploded View

#### B-Pillar Trim Panel

#### Quarter Trim Panel

#### Parcel Shelf

#### Door Trim Panel - Front

#### Door Trim Panel - Rear

#### Headliner

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

← [GROUP 01: Body](#)

---

**SECTION 501-08:**  
**Exterior Trim and Ornamentation**

---

SPECIFICATIONS

REMOVAL AND INSTALLATION

Body Side Moulding

Quarter Panel Moulding

License Plate Housing

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-09: Rear View Mirrors

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Rear View Mirrors

##### Exterior Mirrors

##### Interior Mirror

#### DIAGNOSIS AND TESTING

##### Rear View Mirrors - Exterior

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart - Exterior Mirrors

##### Symptom Chart - NVH

##### Pinpoint Tests

##### Rear View Mirrors - Interior

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart - Interior Mirror

##### Symptom Chart - NVH

##### Pinpoint Tests

#### REMOVAL AND INSTALLATION

##### Exterior Mirrors - Exploded View

##### Exterior Mirror

##### Exterior Mirror Glass

##### Exterior Mirror Motor

##### Lighting Control Module (LCM)

Exterior Mirror Cover

Exterior Mirror Control Switch

Interior Rear View Mirror

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-10: Seating

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Seats

##### Front Seats

##### Power Seat Track

##### Power Recliner

##### Power Lumbar

##### Seat Side Air Bag

##### Heated Seat

##### Occupant Classification Sensor (OCS)

##### Belt Tension Sensor (BTS)

#### DIAGNOSIS AND TESTING

##### Seats

##### Restraint System Diagnostic Service Tool Warning

##### Principles of Operation

##### Front Power Seats

##### Heated Seats

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

#### REMOVAL AND INSTALLATION

##### Seat - Front

##### Seat - Exploded View, Front

##### Lighting Control Module (LCM)

Seat Backrest - Front

Seat Recliner - Manual

Seat Recliner - Power

Lumbar Assembly

Lumbar Control Switch

Seat Control Switch

Heated Seat Switch

Heated Seat Module

Seat Track

Seat - Rear

Seat Armrest - Rear

DISASSEMBLY AND ASSEMBLY

Seat Backrest - Front

Seat Cushion - Front

Seat Armrest - Rear



←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

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## SECTION 501-11: Glass, Frames and Mechanisms

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Glass, Frames and Mechanisms](#)

#### DIAGNOSIS AND TESTING

[Glass, Frames and Mechanisms](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[DTC Chart](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

[Component Tests](#)

#### GENERAL PROCEDURES

[Window Grid Wire Repair](#)

[Lead Terminal Repair](#)

[Window Glass Adjustment](#)

[Front Door Window Glass Adjustment](#)

[Rear Door Window Glass Adjustment](#)

[Glass Reseal - Windshield](#)

[Glass Reseal - Rear](#)

#### REMOVAL AND INSTALLATION

[Windshield Glass](#)

[Glass, Frames and Mechanisms - Exploded View, Front Door](#)

[Window Glass - Front Door](#)

Lighting Control Module (LCM)

Window Regulator and Motor - Front Door

Window Regulator Motor - Front Door

Door Glass Top Run - Front

Glass, Frames and Mechanisms - Exploded View, Rear Door

Window Glass - Rear Door

Window Regulator and Motor - Rear Door

Window Regulator Motor - Rear Door

Window Glass - Rear Quarter

Window Glass - Rear

Window Control Switch

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

← [GROUP 01: Body](#)

---

## SECTION 501-12: Instrument Panel and Console

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### SPECIFICATIONS

### REMOVAL AND INSTALLATION

#### Instrument Panel - Exploded View

#### Instrument Panel

#### Instrument Cluster Finish Panel

#### Console - Overhead

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-14: Handles, Locks, Latches and Entry Systems

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Handles, Locks, Latches and Entry Systems](#)

#### DIAGNOSIS AND TESTING

[Handles, Locks, Latches and Entry Systems](#)

[Principles Of Operation](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Driver Door Module \(DDM\) DTC Chart](#)

[Lighting Control Module \(LCM\) DTC Chart](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

#### GENERAL PROCEDURES

[Keyless Entry Keypad Code Programming](#)

[Remote Keyless Entry \(RKE\) Transmitter Programming](#)

[Autolock and Auto-Unlock Programming](#)

[Latch Lubrication](#)

[Door Handle to Latch Rod Adjustment](#)

#### REMOVAL AND INSTALLATION

[Hood Latch and Components - Exploded View](#)

[Hood Latch](#)

[Hood Latch Release Handle](#)

[Front Door Handles, Locks and Latches - Exploded View](#)

[Lighting Control Module \(LCM\)](#)

Front Door Latch

Front Door Lock Actuator

Door Ajar Switch - Front

Exterior Front Door Handle

Door Lock Cylinder

Rear Door Handles, Locks and Latches - Exploded View

Rear Door Latch

Rear Door Lock Actuator

Door Ajar Switch - Rear Door

Exterior Rear Door Handle

Luggage Compartment Lid Latch

Luggage Compartment Lid Lock Cylinder

Ignition Lock Cylinder - Functional

Ignition Lock Cylinder - Non Functional

Door Lock Control Switch

Keyless Entry Keypad

Antenna

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

← [GROUP 01: Body](#)

---

## SECTION 501-16: Wipers and Washers

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Wipers and Washers

#### DIAGNOSIS AND TESTING

##### Wipers and Washers

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

#### GENERAL PROCEDURES

##### Wiper Blade and Pivot Arm Adjustment

#### REMOVAL AND INSTALLATION

##### Wiper and Washer System - Exploded View

##### Wiper Pivot Arm

##### Wiper Mounting Arm and Pivot Shaft

##### Wiper Motor

##### Washer Pump and Reservoir

← [2010 Crown  
Victoria, Grand  
Marquis  
Contents/Index](#)

← [GROUP 01: Body](#)

---

## SECTION 501-19: Bumpers

---

### SPECIFICATIONS

### REMOVAL AND INSTALLATION

Bumper - Exploded View, Front

Bumper Cover - Front

Bumper Isolator - Front

Bumper - Front

Bumper Bracket - Front

Bumper - Exploded View, Rear

Bumper Cover - Rear

Bumper - Rear

Bumper Bracket - Rear

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-20A: Safety Belt System

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Safety Belt System

##### Active Restraint System Components

##### Safety Belt Retractors

##### Safety Belt Buckles

##### Child Safety Seat Restraints

#### DIAGNOSIS AND TESTING

##### Safety Belt System

##### Principles of Operation

##### Safety Belt Warning System

##### Belt-Minder®

##### Inspection and Verification

##### Symptom Chart

##### Component Test

##### Functional Test - Safety Belt Buckle and Tongue

##### Functional Test - Safety Belt Retractor

##### Functional Test - Safety Belt Retractor, Automatic Locking Retractor (ALR) Mode

##### Functional Test - Safety Belt Retractor, Road Test Inspection

#### GENERAL PROCEDURES

##### Safety Belt Cleaning

##### Safety Belt Maintenance

##### Safety Belt Procedure After a Collision

#### Lighting Control Module (LCM)



Safety Belt Tongue Rotated on Belt

Safety Belt Twisted at the Safety Belt Guide

REMOVAL AND INSTALLATION

Child Safety Seat Tether Anchor

Child Safety Seat Tether Anchor - LATCH

Safety Belt Buckle - Front, Center

Safety Belt Buckle - Front

Safety Belt Retractor and Pretensioner

Safety Belt Retractor - Rear, Center

Safety Belt Buckle - Rear

Safety Belt Retractor - Rear

Safety Belt Shoulder Height Adjuster

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-20B: Supplemental Restraint System

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#)

#### DIAGNOSIS AND TESTING

[Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#)

[Principles of Operation](#)

[Air Bag Warning Indicator](#)

[Air Bag Module Second Stage Deployment](#)

[Clockspring](#)

[Driver Air Bag Module](#)

[Impact Sensors](#)

[Loops/Squibs](#)

[Occupant Classification System \(OCS\) System](#)

[Occupant Classification System Module \(OCSM\)](#)

[Passenger Air Bag Deactivation \(PAD\) Indicator](#)

[Safety Belt Tension Sensor \(BTS\)](#)

[Passenger Air Bag Module](#)

[Restraints Control Module \(RCM\)](#)

[Safety Belt Buckle Switches](#)

[Safety Belt Retractor Pretensioners](#)

[Seat Track Position Sensor](#)

[Secondary Air Bag Warning \(Chime\)](#)

[Seat Side Air Bag Module](#)

[Lighting Control Module \(LCM\)](#)

Diagnostic Instructions

Self Test/Continuous Memory and Clear DTCs

Lamp Fault Code (LFC)

Fault PIDs

Prove Out Procedure

Glossary

Air Bag/Pretensioner Restraint System Diagnostic Tools

Deactivate the Supplemental Restraint System (SRS)

Depower the SRS

Reactivate the SRS

Repower the SRS

Inspection and Verification

DTC Charts

Symptom Chart

Pinpoint Tests

GENERAL PROCEDURES

Supplemental Restraint System (SRS) Depowering and Repowering

Depowering Procedure

Repowering Procedure

Supplemental Restraint System (SRS) Deactivation and Reactivation

Deactivation

Reactivation

Inspection and Repair After a Supplemental Restraint System (SRS) Deployment

Pyrotechnic Device Disposal

Disposal of Deployable Devices and Pyrotechnic Devices That are Undeployed/Inoperative

Disposal of Deployable Devices and Pyrotechnic Devices That Are Deployed

Disposal of Deployable Devices and Pyrotechnic Devices That Require Manual Deployment

Driver Air Bag Module, Passenger Air Bag Module and Seat Side Air Bag Modules - Remote Deployment

Safety Belt Buckle Pretensioners, Safety Belt Retractor Pretensioners and Adaptive Load Limiting Safety Belt Retractors - Remote Deployment

Safety Belt Buckle Pretensioners, Safety Belt Retractor Pretensioners and Load Limiting Safety Belt Retractors - In-Vehicle Deployment

Safety Canopy® Modules and Side Air Curtain Modules - In-Vehicle Deployment

Deployable Steering Column - In-Vehicle Deployment

## REMOVAL AND INSTALLATION

Front Impact Severity Sensor

Side Impact Sensor

Restraints Control Module (RCM)

Driver Air Bag Module

Passenger Air Bag Module

Side Air Bag Module

Clockspring

Occupant Classification Sensor

Seat Position Sensor

Passenger Air Bag Deactivation (PAD) Indicator

←	<a href="#">2010 Crown Victoria, Grand Marquis Contents/Index</a>
←	<a href="#">GROUP 01: Body</a>

---

## SECTION 501-35: Body Repairs

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Body

##### Underhood Dimensions

##### Body Side Closure Dimensions

##### Rear Opening Dimensions

##### Underbody Dimensions

##### Welding Precautions - Steel

##### Sealers

##### Plastic Components

##### Adhesives

##### Sound Deadeners and Insulators

#### GENERAL PROCEDURES

##### Sectioning Guidelines

##### Standard Wheelbase

##### Restoring Corrosion Protection Following Repair

##### Body and Frame Undercoating

##### Refinishing - Environmental Damage

##### Iron Oxide (Rail Dust) or Acid Rain Decontamination

##### Surface Finishing Following Decontamination

##### Refinishing - Manufacturing Damage

##### Plastics Identification

##### Plastics Refinishing

##### Lighting Control Module (LCM)

Weld-Bonding

Weld-Bonding - Squeeze-Type Resistance Spot Welding (STRW) Method

Weld-Bonding - Metal Inert Gas (MIG) Welding Method

Plastics Repair

Sheet-Molded Composite (SMC) Panel Repair

Thermoplastic Compounds

Tab Repair - Bumper

REMOVAL AND INSTALLATION

Frame Members

Ballistic Door Panel

Inner Body Reinforcing Panels

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 02: Frame and Mounting](#)

---

**SECTION 502-02:**  
**Full Frame and Body Mounting**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Frame and Body Mounting

REMOVAL AND INSTALLATION

Crossmember - Number 2

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 03: Engine](#)

---

## SECTION 303-00: Engine System - General Information

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Engine

#### DIAGNOSIS AND TESTING

##### Engine

##### Inspection and Verification - Engine Performance

##### Inspection and Verification - NVH

##### Symptom Chart - Engine Performance

##### Symptom Chart - NVH

##### Component Tests

##### Engine Oil Leaks

##### Compression Test

##### Cylinder Leakage Detection

##### Excessive Engine Oil Consumption

##### Intake Manifold Vacuum Test

##### Oil Pressure Test

##### Valve Train Analysis

#### GENERAL PROCEDURES

##### Sprockets

##### Camshaft Bearing Journal Diameter

##### Camshaft Journal to Bearing Clearance - OHC Engines

##### Camshaft End Play - OHC Engines

##### Camshaft Surface Inspection



Camshaft Lobe Lift

Camshaft Runout

Crankshaft Main Bearing Journal Diameter

Crankshaft Main Bearing Journal Taper and Out-of-Round

Crankshaft Main Bearing Journal-to-Bearing Clearance

Crankshaft End Play

Connecting Rod Bearing Journal Taper and Out-of-Round

Cylinder Bore Taper

Cylinder Bore Out-of-Round

Piston Inspection

Piston Pin Bore Diameter

Piston Diameter

Piston To Cylinder Bore Clearance

Piston Selection

Piston Ring End Gap

Piston Ring-to-Groove Clearance

Piston Pin Diameter

Connecting Rod Cleaning

Connecting Rod Large End Bore

Connecting Rod Bushing Diameter

Connecting Rod Bend

Connecting Rod Twist

Connecting Rod Bearing Journal-to-Bearing Clearance

Connecting Rod to Crankshaft Side Clearance

Roller Follower Inspection

Hydraulic Lash Adjuster Inspection

Valve Stem Diameter

Valve Stem to Valve Guide Clearance

Valve Inspection

Valve Guide Inner Diameter

Valve Spring Installed Length

Valve Spring Free Length

Valve Spring Squareness

Valve Spring Strength

Valve Seat Inspection

Valve and Seat Refacing Measurements

Valve Seat Width

Valve Seat Runout

Cylinder Block Distortion

Cylinder Head Distortion

Cylinder Bore Cleaning

Core Plug Replacement

Spark Plug Inspection

Exhaust Manifold Cleaning and Inspection

Bearing Inspection

Flexplate Inspection

Powertrain/Drivetrain Mount Neutralizing

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 03: Engine](#)

---

**SECTION 303-01:**  
**Engine - 4.6L (2V)**

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SPECIFICATIONS

DESCRIPTION AND OPERATION

Engine

Engine Identification

Engine Code Information Label

Engine Cylinder Identification

Exhaust Emission Control System

Induction System

Valve Train

PCV System

Lubrication System

Oil Pump

DIAGNOSIS AND TESTING

Engine

IN-VEHICLE REPAIR

Intake Manifold

Valve Cover - RH

Valve Cover - LH

Lower End Components - Exploded View, Crankshaft Pulley and Crankshaft Front Seal

Crankshaft Pulley

Crankshaft Front Seal

Engine Front Cover

Timing Drive Components

Valve Train Components - Exploded View

Valve Springs

Valve Seals

Hydraulic Lash Adjuster

Camshaft Roller Follower

Camshaft

Exhaust Manifold - RH

Exhaust Manifold - LH

Engine Lubrication Components - Exploded View, Oil Pan, Oil Pump, Oil Pump Screen and Pickup Tube

Oil Pan

Oil Pump

Oil Pump Screen and Pickup Tube

Oil Filter Adapter

Oil Cooler

Engine Oil Pressure (EOP) Switch

Oil Level Indicator and Tube

Lower End Components - Exploded View, Flexplate and Crankshaft Rear Seal with Retainer Plate

Flexplate

Crankshaft Rear Seal

Crankshaft Rear Seal with Retainer Plate

Engine Mount - RH

Engine Mount - LH

REMOVAL

Cylinder Head

Engine

DISASSEMBLY

Engine

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Cylinder Head

Piston

ASSEMBLY

Engine

Engine Induction System

Engine - Front End and Lower End

Engine - Flex Plate and Engine Lubrication

Engine - Upper End

INSTALLATION

Cylinder Head

Engine

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)  
← [GROUP 03: Engine](#)

---

## SECTION 303-03: Engine Cooling

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Engine Cooling

##### Coolant Flow Diagram - Without Oil Cooler

##### Coolant Flow Diagram - With Oil Cooler

#### DIAGNOSIS AND TESTING

##### Engine Cooling

##### Principles of Operation

##### Inspection and Verification

##### DTC Chart

##### Symptom Chart

##### Pinpoint Tests

##### Component Tests

##### Cooling System Pressure Test

##### Thermostat

##### Radiator Leak Test, Removed From Vehicle

#### GENERAL PROCEDURES

##### Cooling System Draining, Filling and Bleeding

##### Draining

##### Filling and Bleeding with RADKITPLUS

##### Filling and Bleeding without RADKITPLUS

##### Cooling System Flushing

##### Heater Core Backflushing

REMOVAL AND INSTALLATION

Block Heater

Thermostat

Coolant Pump

Radiator

Cooling Fan Motor and Shroud

Degas Bottle

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 03: Engine](#)

---

## **SECTION 303-04: Fuel Charging and Controls - 4.6L (2V)**

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### **SPECIFICATIONS**

#### **DESCRIPTION AND OPERATION**

[Fuel Charging and Controls](#)

[Throttle Body \(TB\)](#)

[Fuel Injectors](#)

[Fuel Rail](#)

[Fuel Rail Pressure and Temperature Sensor](#)

[Fuel Pump Driver Module \(FPDM\)](#)

#### **DIAGNOSIS AND TESTING**

[Fuel Charging and Controls](#)

#### **REMOVAL AND INSTALLATION**

[Throttle Body](#)

[Throttle Body - Spacer](#)

[Fuel Rail and Fuel Injector - Exploded View](#)

[Intake Manifold Bracket, Hoses and Electrical Connectors](#)

[Intake Manifold Shield, Hoses and Electrical Connectors](#)

[Fuel Rail and Injectors](#)

[Fuel Rail](#)

[Fuel Injectors](#)

[Fuel Pump Driver Module \(FPDM\)](#)



← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 03: Engine](#)

---

## SECTION 303-05: Accessory Drive

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Accessory Drive](#)

[Accessory Drive Belt Routing](#)

[Belt Tensioner](#)

#### DIAGNOSIS AND TESTING

[Accessory Drive](#)

[Inspection and Verification](#)

[Symptom Chart](#)

[Component Tests](#)

[Drive Belt - Noise/Flutter](#)

[Drive Belt - Incorrect Installation](#)

[Belt Tensioner - Mechanical](#)

[Belt Tensioner - Dynamics](#)

#### REMOVAL AND INSTALLATION

[Front End Accessory Drive \(FEAD\) - Exploded View](#)

[Accessory Drive Belt](#)

[Accessory Drive Belt Tensioner](#)

[Accessory Drive Belt Idler Pulley](#)

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)  
← [GROUP 03: Engine](#)

---

## SECTION 303-06: Starting System

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Starting System

##### Starting System - Starter Motor

##### Starting System - Starter Relay

##### Starting System - Normal Operation

#### DIAGNOSIS AND TESTING

##### Starting System

##### Principles of Operation

##### Inspection and Verification

##### DTC Charts

##### Symptom Chart

##### Pinpoint Tests

##### Component Tests

##### Starter Motor - Motor Feed Circuit

##### Starter Motor - Motor Ground Circuit

#### GENERAL PROCEDURES

##### Starter Motor Drive Gear and Flywheel Ring Gear Inspection

#### REMOVAL AND INSTALLATION

##### Starter Motor Solenoid Relay - ISO Mini

##### Starter Motor

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)  
← [GROUP 03: Engine](#)

---

**SECTION 303-07:  
Engine Ignition - 4.6L (2V)**

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**SPECIFICATIONS**

**DESCRIPTION AND OPERATION**

**Engine Ignition**

**DIAGNOSIS AND TESTING**

**Engine Ignition**

**REMOVAL AND INSTALLATION**

**Engine Ignition Components - Exploded View**

**LH Side**

**RH Side**

**Ignition Coil-On-Plug**

**Spark Plugs**

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 03: Engine](#)

---

## SECTION 303-08: Engine Emission Control

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

Engine Emission Control

EGR System

PCV System

Vehicle Emission Vacuum Routing

#### DIAGNOSIS AND TESTING

Engine Emission Control

#### REMOVAL AND INSTALLATION

Exhaust Gas Recirculation (EGR) System Components - Exploded View

EGR System Module

EGR System Module Tube

Exhaust Gas Recirculation (EGR) System Module

Exhaust Gas Recirculation (EGR) System Module Tube

Positive Crankcase Ventilation (PCV) Valve

Crankcase Ventilation Tube

LH Crankcase Ventilation Tube

RH Crankcase Ventilation Tube

- ← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)
- ← [GROUP 03: Engine](#)

---

## SECTION 303-12: Intake Air Distribution and Filtering

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Intake Air Distribution and Filtering

#### DIAGNOSIS AND TESTING

##### Intake Air Distribution and Filtering

#### REMOVAL AND INSTALLATION

##### Intake Air System Components - Exploded View

##### Air Cleaner Outlet Pipe

##### Air Cleaner

##### Air Cleaner Element

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)  
← [GROUP 03: Engine](#)

---

## SECTION 303-13: Evaporative Emissions

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Evaporative Emissions

#### DIAGNOSIS AND TESTING

##### Evaporative Emissions

#### GENERAL PROCEDURES

##### Evaporative Emission System Leak Test

#### REMOVAL AND INSTALLATION

##### Evaporative Emission Canister

##### Evaporative Emission Canister Purge Valve

##### Fuel Vapor Tube Assembly

##### Fill Limiting Vent Valve

##### Evaporative Emission Canister Vent Solenoid

##### Dust Separator

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 03: Engine](#)

---

## SECTION 303-14: Electronic Engine Controls

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Electronic Engine Controls](#)

#### DIAGNOSIS AND TESTING

[Electronic Engine Controls](#)

#### REMOVAL AND INSTALLATION

[Camshaft Position \(CMP\) Sensor](#)

[Crankshaft Position \(CKP\) Sensor](#)

[Powertrain Control Module \(PCM\)](#)

[Throttle Position \(TP\) Sensor](#)

[Mass Air Flow \(MAF\) Sensor](#)

[Heated Oxygen Sensor \(HO2S\) and Catalyst Monitor Sensor - Exploded View](#)

[Heated Oxygen Sensor \(HO2S\)](#)

[Catalyst Monitor Sensor](#)

[Fuel Rail Pressure and Temperature Sensor](#)

[Cylinder Head Temperature \(CHT\) Sensor](#)

[Knock Sensor \(KS\)](#)

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 04: Suspension](#)

---

**SECTION 204-00:**  
**Suspension System - General Information**

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**SPECIFICATIONS**

**DESCRIPTION AND OPERATION**

Wheel Alignment Angles

Camber

Caster

Toe

Wander

Shimmy

Nibble

Poor Returnability/Sticky Steering

Drift/Pull

Poor Groove Feel

**DIAGNOSIS AND TESTING**

Suspension System

Inspection and Verification

Symptom Chart - Suspension System

Symptom Chart - NVH

Pinpoint Tests

Component Test

Ball Joint Inspection

**GENERAL PROCEDURES**

Ride Height Measurement

Front Ride Height Measurement



Rear Ride Height Measurement

Camber and Caster Adjustment

Toe Adjustment

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 04: Suspension](#)

---

## SECTION 204-01: Front Suspension

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Front Suspension

#### DIAGNOSIS AND TESTING

##### Front Suspension

#### REMOVAL AND INSTALLATION

##### Wheel Bearing and Wheel Hub

##### Wheel Knuckle

##### Wheel Studs

##### Lower Arm

##### Upper Arm

##### Stabilizer Bar

##### Stabilizer Bar Link

##### Ball Joint - Lower

##### Shock Absorber and Spring Assembly

#### DISASSEMBLY AND ASSEMBLY

##### Shock Absorber and Spring Assembly

- ← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)
- ← [GROUP 04: Suspension](#)

---

## SECTION 204-02: Rear Suspension

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Rear Suspension

#### DIAGNOSIS AND TESTING

##### Rear Suspension

#### REMOVAL AND INSTALLATION

##### Wheel Studs

##### Lower Arm

##### Upper Arm

##### Lateral Arm and Watts Link Pivot Assembly

##### Stabilizer Bar and Link

##### Shock Absorber

##### Spring - Coil

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 04: Suspension](#)

---

## **SECTION 204-04: Wheels and Tires**

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Wheels And Tires

##### Tire Pressure Monitoring System (TPMS)

##### Tire Pressure Monitoring System (TPMS) Module

##### Tire Pressure Monitoring System (TPMS) Pressure Sensor

##### Tire Pressure Monitoring System (TPMS) Pressure Sensor Cradle

##### Tire Pressure Monitoring System (TPMS) Pressure Sensor Strap

#### DIAGNOSIS AND TESTING

##### Wheels And Tires

##### Inspection and Verification

##### Tire Wear

##### Symptom Chart - Tire Wear

##### Symptom Chart - NVH

##### Pinpoint Tests

##### Component Tests

##### Radial Runout

##### Loaded Runout Measurement (Hunter Road Force® 9700 Series Wheel Balancer)

##### Runout Measurement (Dial Indicator)

##### Match Mounting

##### Wheel-to-Hub Optimization

##### Tire Pressure Monitoring System

##### Principles of Operation

Ambient Temperature Change and Tire Pressure

Tire Pressure Monitoring System (TPMS) Indicator and Message Center Messages

Tire Pressure Monitoring System (TPMS) Indicator Illuminates Continuously

Tire Pressure Monitoring System (TPMS) Indicator Flashes

Inspection and Verification

DTC Charts

Symptom Chart

Pinpoint Tests

GENERAL PROCEDURES

Tire Pressure Monitoring System (TPMS) Sensor Training

Tire Pressure Monitoring System (TPMS) Sensor Activation

REMOVAL AND INSTALLATION

Wheel and Tire

DISASSEMBLY AND ASSEMBLY

Wheel and Tire

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Tire Pressure Monitoring System (TPMS) Sensor

Tire Pressure Monitoring System (TPMS) Strap and Cradle

- ← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)
- ← [GROUP 04: Suspension](#)

---

## SECTION 204-05: Vehicle Dynamic Suspension

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Vehicle Dynamic Suspension

#### DIAGNOSIS AND TESTING

##### Vehicle Dynamic Suspension

##### Principles of Operation

##### Inspection and Verification

##### Vehicle Dynamics Module (VDM) DTC Chart

##### Symptom Chart

##### Pinpoint Tests

##### Component Test

##### Air Suspension Relay

##### Pneumatic Test

##### Trim Height Test (or Accurate Trim Test)

#### GENERAL PROCEDURES

##### Ride Height Adjustments

##### Air Leaks

##### Air Tube Repair

##### Air Line Fluid Purge

##### Air Spring Inflation and Deflation

##### Air Spring Refold

#### REMOVAL AND INSTALLATION

##### Air Suspension Switch

Air Suspension Compressor

Air Suspension Compressor Drier

Vehicle Dynamics Module (VDM)

Air Spring

Air Spring Solenoid Valve

Suspension Height Sensor

- ← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)
- ← [GROUP 05: Driveline](#)

---

## SECTION 205-00: Driveline System - General Information

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Driveline System

##### Axle Identification

#### DIAGNOSIS AND TESTING

##### Driveline System

##### Principals of Operation

##### Driveline System - General Information

##### Inspection and Verification

##### Symptom Chart - Driveline System

##### Symptom Chart - NVH

##### Analysis of Leakage

##### Component Tests

##### Traction-Lok Differential Operation Check

##### Traction-Lok Differential Check Road Test

##### Pinion Flange Runout Check - Circular

#### GENERAL PROCEDURES

##### Driveline Angle Measurement

##### Driveshaft Runout and Balancing

##### Driveshaft Inspection

##### Driveshaft Runout

##### Driveshaft Balancing - Using the MTS 4000

##### Driveshaft Balancing - Hose Clamp Method



- ← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)
- ← [GROUP 05: Driveline](#)

---

## SECTION 205-01: Driveshaft

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Driveshaft

##### Universal Joints

#### DIAGNOSIS AND TESTING

##### Driveshaft

#### REMOVAL AND INSTALLATION

##### Driveshaft

#### DISASSEMBLY AND ASSEMBLY

##### Driveshaft Universal Joint

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 05: Driveline](#)

---

**SECTION 205-02:**  
**Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Rear Drive Axle and Differential

DIAGNOSIS AND TESTING

Rear Drive Axle and Differential

GENERAL PROCEDURES

Ring Gear Backlash Adjustment

IN-VEHICLE REPAIR

Axle Shaft

Rear Wheel Bearing and Axle Shaft Seal

Drive Pinion Flange and Drive Pinion Seal

Differential Housing Cover

Differential Ring And Pinion

Differential Bearings

REMOVAL AND INSTALLATION

Axle Assembly

Differential Carrier

DISASSEMBLY AND ASSEMBLY

Differential Case and Ring Gear - Conventional

Differential Case and Ring Gear - Traction-Lok

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

**SECTION 206-00:**  
**Brake System - General Information**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Brake System

DIAGNOSIS AND TESTING

Principles of Operation

Brake System

Brake Master Cylinder Compensator Ports

Red Brake Warning Indicator

Inspection And Verification

Symptom Chart

Symptom Chart - Brake System

Symptom Chart - NVH

Pinpoint Tests

Component Tests

Brake Booster

Brake Master Cylinder - Bypass Condition

Brake Master Cylinder - Compensator Port

GENERAL PROCEDURES

Brake System Inspection

Brake Pads

Brake Discs

Brake Calipers

Brake Caliper Guide Pins

Brake Flexible Hoses and Tubes

Lighting Control Module (LCM)

Brake Master Cylinder

Brake Booster

Brake Disc Machining

Component Bleeding

Master Cylinder

Brake Caliper

Brake System Bleeding

Pressure Bleeding

Manual Bleeding

Hydraulic Control Unit (HCU)

← [2010 Crown Victoria, Grand  
Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

**SECTION 206-03:**  
**Front Disc Brake**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Front Disc Brake

DIAGNOSIS AND TESTING

Front Disc Brake

REMOVAL AND INSTALLATION

Brake Pads

Brake Caliper

Brake Caliper Anchor Plate

Brake Disc

Brake Flexible Hose

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

## SECTION 206-04: Rear Disc Brake

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Rear Disc Brake

#### DIAGNOSIS AND TESTING

##### Rear Disc Brake

#### REMOVAL AND INSTALLATION

##### Disc Brake System - Exploded View

##### Brake Caliper

##### Brake Pads

##### Brake Disc

##### Brake Caliper Anchor Plate

##### Brake Flexible Hose

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

## SECTION 206-05: Parking Brake and Actuation

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Parking Brake

#### DIAGNOSIS AND TESTING

##### Parking Brake

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

#### GENERAL PROCEDURES

##### Parking Brake Cable Adjustment

##### Parking Brake Shoe Adjustment

#### REMOVAL AND INSTALLATION

##### Parking Brake Control

##### Parking Brake Cable - Front

##### Parking Brake Cable - Rear

##### Parking Brake Shoes

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

## SECTION 206-06: Hydraulic Brake Actuation

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Hydraulic Brake Actuation](#)

[Hydraulic Brake Actuation](#)

[Adjustable Pedals](#)

#### DIAGNOSIS AND TESTING

[Principles of Operation](#)

[Hydraulic Brakes](#)

[Adjustable Pedals](#)

[Inspection And Verification](#)

[Symptom Chart](#)

[Pinpoint Test](#)

#### GENERAL PROCEDURES

[Adjustable Pedal Indexing](#)

#### REMOVAL AND INSTALLATION

[Brake Pedal and Bracket](#)

[Brake Master Cylinder](#)

[Brake Fluid Reservoir](#)



← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

## **SECTION 206-07: Power Brake Actuation**

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Brake Booster

#### DIAGNOSIS AND TESTING

##### Power Brake System

#### REMOVAL AND INSTALLATION

##### Brake Booster

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 06: Brake System](#)

---

## SECTION 206-09: Vehicle Dynamic Systems

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

Anti-Lock Control

ABS with Engine Only Traction Control (EOTC)

Anti-Lock Control

Engine Only Traction Control (EOTC) System

Stability/Traction Control Switch

#### DIAGNOSIS AND TESTING

Anti-Lock Control

Principles of Operation

Anti-Lock Control

Electronic Brake Distribution (EBD)

Engine Only Traction Control (EOTC) System

Inspection and Verification

DTC Charts

Symptom Chart

Pinpoint Tests

#### REMOVAL AND INSTALLATION

Hydraulic Control Unit (HCU)

Anti-Lock Brake System (ABS) Module

Wheel Speed Sensor - Front

Wheel Speed Sensor - Rear

Stability/Traction Control Switch

Lighting Control Module (LCM)

- ← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)
- ← [GROUP 07: Automatic Transmission](#)

---

**SECTION 307-01:**  
**Automatic Transaxle/Transmission - 4R70E/4R75E**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Transmission Description

Identification Tags

Range Selection

Park

Reverse

Neutral

Overdrive (D)

Position 2 - 2nd Gear

Position 1 - 1st Gear

Shift Patterns

Upshifts

Downshifts

Coastdown

Torque Demand

Kickdown

Bushings, Bearing and Thrust Washer Locator

Seals, Rings and Gasket Locator

Main Components and Functions

Torque Converter

Geartrain

Planetary Gearset

Input Shaft

Lighting Control Module (LCM)

Stub Shaft

Output Shaft

Apply Components

Band - Overdrive (O/D)

Band - Low and Reverse

Clutch - Intermediate

Clutch - Forward

Clutch - Direct

Clutch - Reverse

One-Way Clutch (OWC) - Planetary (Low)

One-Way Clutch (OWC) - Intermediate

Hydraulic System

Pump

Transmission Fluid Filter

Main Control

Accumulators

Transmission Electronic Control System

PCM

A/C Clutch

Brake Pedal Position (BPP) Switch

Cylinder Head Temperature (CHT) Sensor

Electronic Pressure Control (EPC) Solenoid

Ignition Coil - Coil On Plug

Intake Air Temperature (IAT) Sensor

Mass Air Flow (MAF) Sensor

Transmission Control Switch (TCS) and Transmission Control Indicator Lamp (TCIL)

Throttle Position (TP) Sensor

Lighting Control Module (LCM)

Transmission Range (TR) Sensor

Output Shaft Speed (OSS) Sensor

Turbine Shaft Speed (TSS) Sensor

Torque Converter Clutch (TCC) Solenoid

Shift Solenoid A (SSA) and Shift Solenoid B (SSB)

Transmission Fluid Temperature (TFT) Sensor

DIAGNOSIS AND TESTING

Diagnostic Strategy

Preliminary Inspection

Diagnostics

Diagnostic Flow Chart

Preliminary Inspection

Know and Understand the Concern

Verification of Condition

Check Transmission Fluid Level and Condition

Water in Transmission Fluid

Shift Point Road Test

Torque Converter Diagnosis

Torque Converter Operation Test

Visual Inspection

Selector Lever Linkage Check

Check TSBs

Carry Out On-Board Diagnostic (OBD) Key ON Engine OFF (KOEO), Key ON Engine Running (KOER)

Diagnostics

On-Board Diagnostic (OBD) With Scan Tool

Diagnostic Parameters Identification (PID) Chart

Transmission Drive Cycle Test

After On-Board Diagnostic (OBD)

Before Pinpoint Tests

Diagnostic Trouble Code (DTC) Charts

Transmission Connector Layouts

Pinpoint Tests - OSC Equipped Vehicle

Shift Solenoids Pre-Diagnosis

Pinpoint Tests

Special Testing Procedures

Engine Idle Speed Check

Line Pressure Test

Stall Speed Test

Air Pressure Tests

Clutch Pressure Test

Leakage Inspection

Transmission Fluid Cooler

Diagnosis By Symptom

Diagnosis by Symptom Index Directions

Diagnostic Routines

GENERAL PROCEDURES

Transmission Fluid Cooler Tubes Backflushing and Cleaning

Transmission Fluid Drain and Refill

Draining

Refill

Transmission Fluid Exchange

Transmission Range (TR) Sensor Adjustment

Torque Converter Contamination Inspection

IN-VEHICLE REPAIR

Fluid Pan, Gasket and Filter

Transmission Filler Tube

Main Control Valve Body

Extension Housing Gasket

Extension Housing Seal

Electronic Pressure Control (EPC) Solenoid

Manual Control Lever Shaft and Seal

Digital Transmission Range (TR) Sensor

Reverse Servo Assembly

Overdrive Servo

1-2 Accumulator

2-3 Accumulator

Transmission Insulator and Retainer

Transmission Support Crossmember

Turbine Shaft Speed (TSS) Sensor

Output Shaft Speed (OSS) Sensor

REMOVAL

Transmission

DISASSEMBLY

Transmission

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

Main Control Valve Body

Pump and Intermediate Clutch Piston

Intermediate One-Way Clutch

Reverse Clutch

Forward Clutch Cylinder

Planetary Gear Support Assembly and Planetary One-Way Clutch

Reverse Sun Gear

Output Shaft and Direct Clutch Cylinder

ASSEMBLY

Transmission

Disassembled View

INSTALLATION

Transmission



- ← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)
- ← [GROUP 07: Automatic Transmission](#)

---

## SECTION 307-02: Transaxle/Transmission Cooling

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Transmission Cooling

#### DIAGNOSIS AND TESTING

##### Transmission Cooling

##### Inspection and Verification

##### Symptom Chart - Transmission Cooling

##### Symptom Chart - NVH

#### GENERAL PROCEDURES

##### Transmission Fluid Cooler Backflushing and Cleaning

#### REMOVAL AND INSTALLATION

##### Transmission Fluid Cooler

##### Transmission Fluid Cooler Tubes

- ← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)
- ← [GROUP 07: Automatic Transmission](#)

---

**SECTION 307-05:**  
**Automatic Transaxle/Transmission External Controls**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

External Controls

Selector Lever Linkage

Brake Shift Interlock Actuator (BSIA)

Transmission Control Switch (TCS)

DIAGNOSIS AND TESTING

External Controls

Inspection and Verification

Symptom Chart - External Controls

Symptom Chart - NVH

Pinpoint Tests

GENERAL PROCEDURES

Selector Lever Cable Adjustment

Selector Lever Indicator Adjustment

REMOVAL AND INSTALLATION

Brake Shift Interlock Actuator

Selector Lever Cable and Bracket

Selector Lever

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 09: Exhaust System](#)

---

## SECTION 309-00: Exhaust System

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Exhaust System

#### DIAGNOSIS AND TESTING

##### Exhaust System

##### Inspection and Verification

##### Symptom Chart - Exhaust System

##### Symptom Chart - NVH

##### Pinpoint Test

#### GENERAL PROCEDURES

##### Exhaust System Alignment

#### REMOVAL AND INSTALLATION

##### Exhaust System - Exploded View

##### Single Exhaust

##### Dual Exhaust

##### Muffler and Tailpipe

##### Muffler and Tailpipe - Fire Suppression System

##### Catalytic Converter

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 10: Fuel System](#)

---

**SECTION 310-00:**  
**Fuel System - General Information**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Fuel System

DIAGNOSIS AND TESTING

Fuel System

Principles of Operation

Inspection and Verification

DTC Chart

Symptom Chart

Pinpoint Test

GENERAL PROCEDURES

Fuel System Pressure Release

Fuel System Pressure Test

Fuel Tank Draining

Spring Lock Couplings

Quick Connect Coupling

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 10: Fuel System](#)

---

## **SECTION 310-01: Fuel Tank and Lines**

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

[Fuel Tank and Lines](#)

#### DIAGNOSIS AND TESTING

[Fuel Tank and Lines](#)

#### REMOVAL AND INSTALLATION

[Fuel Tank and Filler Pipe - Exploded View](#)

[Fuel Tank and Filler Pipe](#)

[Fuel Tubes](#)

[Fuel Tank](#)

[Fuel Tank Filler Pipe](#)

[Fuel Pump Module](#)

[Fuel Level Sender](#)

[Fuel Lines and Fuel Filter - Exploded View](#)

[Fuel Lines](#)

[Fuel Filter](#)

[Inertia Fuel Shutoff \(IFS\) Switch](#)

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 10: Fuel System](#)

---

**SECTION 310-02:**  
**Acceleration Control**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Acceleration Control

DIAGNOSIS AND TESTING

Acceleration Control

REMOVAL AND INSTALLATION

Accelerator Pedal

Fixed Accelerator Pedal and Sensor Assembly

Adjustable Pedal Accelerator Pedal and Sensor Assembly

Accelerator Pedal and Bracket

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 11: Steering System](#)

---

## SECTION 211-00: Steering System

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Steering System

#### DIAGNOSIS AND TESTING

##### Steering System

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart - Steering System

##### Symptom Chart - NVH

##### Pinpoint Tests

##### Component Tests

##### Power Steering Fluid Leak Test

##### Steering Gear Valve Test

##### Steering Gear Grunt/Shudder Test

##### Steering Linkage Test

#### GENERAL PROCEDURES

##### Power Steering System Flushing

##### Power Steering System Purging

##### Power Steering System Filling

- ← [2010 Crown Victoria, Grand Marquis Contents/Index](#)
- ← [GROUP 11: Steering System](#)

---

## SECTION 211-02: Power Steering

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Power Steering

##### Power Steering - Hydraulic System

##### Power Steering Gear Identification

##### Power Steering Pump Identification

#### DIAGNOSIS AND TESTING

##### Power Steering

#### REMOVAL AND INSTALLATION

##### Power Steering Fluid Reservoir

##### Power Steering Pump

##### Power Steering Pump Pulley

##### Power Steering Fluid Cooler

##### Power Steering Pump to Steering Gear Pressure Line

##### Steering Gear

##### Inner Tie Rod

##### Steering Gear Turn Tubes



- ← [2010 Crown Victoria, Grand Marquis Contents/Index](#)
- ← [GROUP 11: Steering System](#)

---

## SECTION 211-04: Steering Column

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Steering Column

#### DIAGNOSIS AND TESTING

##### Steering Column

#### GENERAL PROCEDURES

##### Steering Wheel Wrap Bonding

#### REMOVAL AND INSTALLATION

##### Steering Wheel

##### Steering Column

##### Steering Column Shaft

##### Steering Column Shroud

#### DISASSEMBLY AND ASSEMBLY

##### Steering Column

- ← [2010 Crown Victoria, Grand Marquis Contents/Index](#)
- ← [GROUP 11: Steering System](#)

---

## SECTION 211-05: Steering Column Switches

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Steering Column Switches

#### DIAGNOSIS AND TESTING

##### Steering Column Switches

##### Principles of Operation

##### Inspection and Verification

##### Pinpoint Tests

##### Component Tests

##### Ignition Switch - Mechanical

##### Ignition Switch - Electrical

##### Multifunction Switch - Electrical

#### REMOVAL AND INSTALLATION

##### Steering Column Multifunction Switch

##### Ignition Switch

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 12: Climate Control System](#)

---

**SECTION 412-00:**  
**Climate Control System - General Information and Diagnostics**

---

SPECIFICATIONS

DESCRIPTION AND OPERATION

Climate Control System

External Temperature Display

System Air Flow Description - Manual Climate Control

System Airflow Description - Electronic Automatic Temperature Control (EATC)

DIAGNOSIS AND TESTING

Climate Control System

Principles of Operation

Compressor Anti-Slugging Strategy (CASS)

The Refrigerant Cycle

Vacuum System

Inspection and Verification

PCM DTC Chart

DTC Chart

Symptom Chart - Climate Control Systems

Symptom Chart - NVH

Pinpoint Tests

Component Tests

Resistor - Blower Motor

Temperature Sensor - Ambient

Temperature Sensor - In-Vehicle

Heater Core

Heater Core - Pressure Test

Lighting Control Module (LCM)

A/C Compressor - External Leak Test

GENERAL PROCEDURES

Spring Lock Coupling

Disconnect

Connect

Refrigerant System Tests

Procedure 1 - Ambient Temperature at or Below 38°C (100°F)

Procedure 2 - Ambient Temperature Above 38°C (100°F)

Air Conditioning (A/C) Clutch Air Gap Adjustment

Electronic Leak Detection

Fluorescent Dye Leak Detection

Fluorescent Dye Injection Using a R-134a Refrigerant Management Machine and Dye Injector - Vehicles Requiring R-134a Addition

Fluorescent Dye Injection Using a R-134a Loop/Add On Injector Kit-Set - Vehicles Not Requiring R-134a Addition

Fluorescent Dye Detection

Air Conditioning (A/C) System Recovery, Evacuation and Charging

Refrigerant System Recovery

Refrigerant System Evacuation Using a R-134a Refrigerant Management Machine

Refrigerant System Evacuation Using a R-134a Manifold Gauge Set and Vacuum Pump

Refrigerant System Charging Using a R-134a Refrigerant Management Machine

Refrigerant System Charging Using a R-134a Manifold Gauge Set and Automatic Refrigerant Charging Meter

Air Conditioning (A/C) System Flushing

Refrigerant System Filtering Following Air Conditioning (A/C) Compressor Installation

Refrigerant Oil Adding

Refrigerant Oil Adding

Adding Refrigerant Oil After A/C Compressor Replacement

Adding Refrigerant Oil After New Suction Accumulator or Receiver/Drier Replacement

Adding Refrigerant Oil After Multiple Component Replacement After A/C System Contamination

Oil Injection Using a Dye/Lubricant Injector

Refrigerant Identification Testing

Refrigerant Identification

Contaminated Refrigerant Handling

Vacuum Hose Repair - Mini-Tube

Air Conditioning (A/C) Odor Treatment

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 12: Climate Control System](#)

---

## SECTION 412-01: Climate Control

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Air Conditioning

##### A/C Compressor and Clutch Assembly

##### A/C Compressor Pressure Relief Valve

##### A/C Condenser/Transmission Combo Cooler

##### A/C Evaporator Core

##### A/C Evaporator Core Orifice

##### Suction Accumulator

##### A/C Pressure Sensor

##### A/C Cycling Switch

##### Spring Lock Coupling

##### A/C Line (Peanut) Fitting

##### Service Gauge Port Valves

##### Refrigerant System Dye

##### Air Distribution and Filtering

##### Control Components

##### Electronic Automatic Temperature Control (EATC)

##### Control System Inputs - Electronic Automatic Temperature Control (EATC)

##### Control System Outputs - Electronic Automatic Temperature Control (EATC)

##### Manual Climate Control

##### Control System Inputs - Manual Climate Control

##### Control System Outputs - Manual Climate Control

##### Heating and Ventilation

##### Lighting Control Module (LCM)

Heater Core

Blower Motor

Heater Control Valve

## REMOVAL AND INSTALLATION

Air Conditioning (A/C) Compressor

Air Conditioning (A/C) Pressure Relief Valve

Air Inlet Duct

Ambient Air Temperature Sensor

Blower Motor

Blower Motor Speed Control

Blower Motor Switch

Climate Control Assembly

Clutch and Clutch Field Coil

Compressor to Condenser Discharge Line

Condenser Core

Condenser to Evaporator Line

Evaporator Core

Evaporator Core Housing

Evaporator Core Orifice

Footwell Duct - Rear

Function Selector Switch

Heater Core

Heating Ventilation Air Conditioning (HVAC) Module

In-Vehicle Temperature Sensor

Plenum Chamber

Register - Driver Side and Center

Register - Passenger Side

Lighting Control Module (LCM)

Suction Accumulator

Suction Accumulator to Compressor Line

Suction Accumulator To Evaporator Line

Temperature Blend Door Actuator

Temperature Control Switch

Vacuum Control Motor - Air Inlet Door

Vacuum Control Motor - Floor Defrost Door

Vacuum Control Motor - Panel Door

Vacuum Reservoir



← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 13: Instrumentation and Warning Systems](#)

---

**SECTION 413-00:**  
**Instrument Cluster and Panel Illumination**

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DESCRIPTION AND OPERATION

[Instrument Cluster and Panel Illumination](#)

DIAGNOSIS AND TESTING

[Instrument Cluster and Panel Illumination](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

REMOVAL AND INSTALLATION

[Instrument Panel Dimmer Switch](#)

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 13: Instrumentation and Warning Systems](#)

---

## **SECTION 413-01: Instrumentation, Message Center, and Warning Chimes**

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### DESCRIPTION AND OPERATION

[Instrument Cluster \(IC\)](#)

[Information And Message Center](#)

[Warning Chimes](#)

### DIAGNOSIS AND TESTING

[Instrumentation, Message Center and Warning Chimes](#)

[Principles of Operation](#)

[Instrument Cluster \(IC\)](#)

[Information And Message Center](#)

[Warning Chimes](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Instrument Cluster \(IC\) DTC Chart](#)

[Fire Suppression System Module \(FSSM\) DTC Chart](#)

[Lighting Control Module \(LCM\) DTC Chart](#)

[PCM DTC Chart](#)

[Symptom Charts](#)

[Pinpoint Tests](#)

### GENERAL PROCEDURES

[Message Center Configuration](#)

[Oil Life Reset](#)

[Oil Life Start Value](#)

[Belt-Minder® Deactivating/Activating](#)

### REMOVAL AND INSTALLATION

[Instrument Cluster \(IC\)](#)

[Lighting Control Module \(LCM\)](#)

Instrument Cluster (IC) Lens

Message Center Switch

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 13: Instrumentation and Warning Systems](#)

---

## **SECTION 413-06: Horn**

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Horn

#### DIAGNOSIS AND TESTING

##### Horn

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 14: Battery and Charging System](#)

---

## SECTION 414-00: Charging System

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Charging System

#### DIAGNOSIS AND TESTING

##### Principles of Operation

##### Inspection And Verification

##### Diagnostic Trouble Code (DTC) Chart

##### Symptom Chart

##### Pinpoint Test

#### REMOVAL AND INSTALLATION

##### Generator

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 14: Battery and Charging System](#)

---

## **SECTION 414-01: Battery, Mounting and Cables**

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Battery and Cables

#### DIAGNOSIS AND TESTING

##### Principles of Operation

##### Inspection And Verification

##### Pinpoint Test

##### Component Test

##### Battery - Drain Tests

#### GENERAL PROCEDURES

##### Battery Disconnect

#### REMOVAL AND INSTALLATION

##### Battery and Battery Tray - Exploded View

##### Battery

##### Battery Tray

##### Battery Cables

← [2010 Crown Victoria, Grand Marquis Contents/Index](#)

← [GROUP 15: Audio Systems](#)

---

**SECTION 415-00:**  
**Information and Entertainment Systems**

---

DESCRIPTION AND OPERATION  
[Information and Entertainment System](#)

DIAGNOSIS AND TESTING

[Information and Entertainment System](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[Speaker Walk-Around Test](#)

[Audio Unit Self-Diagnostic Mode](#)

[DTC Charts](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

GENERAL PROCEDURES

[Audio Unit Part Number Retrieval](#)

REMOVAL AND INSTALLATION

[Antenna Lead-In Cable](#)

[Antenna Module](#)

[Audio Unit](#)

[Door Speaker](#)

[Parcel Shelf Speaker](#)

[Steering Wheel Controls](#)

[Speaker - Subwoofer](#)

[Subwoofer Amplifier](#)

← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)

← [GROUP 17: Lighting](#)

---

## SECTION 417-01: Exterior Lighting

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### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Exterior Lighting

#### DIAGNOSIS AND TESTING

##### Diagnostic Trouble Code (DTC) Chart

##### Lighting Control Module (LCM) DTC Chart

##### Driver Door Module (DDM) DTC Chart

##### Headlamps

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

##### Autolamps

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

##### Stoplamps

##### Principles of Operation

##### Inspection and Verification

##### Symptom Chart

##### Pinpoint Tests

##### Turn Signal, Cornering and Hazard Lamps



Principles of Operation

Inspection and Verification

Symptom Chart

Pinpoint Tests

Parking, Rear and License Plate Lamps

Principles of Operation

Inspection and Verification

Symptom Chart

Pinpoint Tests

Fog Lamps

Principles of Operation

Inspection and Verification

Symptom Chart

Pinpoint Tests

Reversing Lamps

Principles of Operation

Inspection and Verification

Symptom Chart

Pinpoint Tests

Public Safety - Police Package

Inspection and Verification

Symptom Chart

Pinpoint Tests

Daytime Running Lamps (DRL)

Principles of Operation

Inspection and Verification

Symptom Chart

Pinpoint Tests

GENERAL PROCEDURES

Headlamp Adjustment

Headlamp Aiming

Photometric Aiming

Screen Method Aiming

Mechanical Aiming

Autolamps Time Delay Adjustment

Front Fog Lamp Adjustment

REMOVAL AND INSTALLATION

Headlamp Assembly

Headlamp Bulb

Fog Lamp

Fog Lamp Bulb

Side Turn Signal Lamp

Stoplamp Switch

Light Sensor

Headlamp Switch

High Mounted Stoplamp

Rear Lamp Assembly

Spotlamp

- ← [2010 Crown Victoria,  
Grand Marquis  
Contents/Index](#)
- ← [GROUP 17: Lighting](#)

---

## SECTION 417-02: Interior Lighting

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### DESCRIPTION AND OPERATION

[Interior Lighting](#)

[Courtesy Lamps](#)

[Demand Lamps](#)

[Dark Car Feature](#)

### DIAGNOSIS AND TESTING

[Interior Lighting](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Lighting Control Module \(LCM\) DTC Chart](#)

[Driver Door Module \(DDM\) DTC Chart](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 18: Electrical Distribution](#)

---

**SECTION 418-00:**  
**Module Communications Network**

---

DESCRIPTION AND OPERATION

[Communications Network](#)

DIAGNOSIS AND TESTING

[Communications Network](#)

[Principles of Operation](#)

[Controller Area Network \(CAN\) Multiplex Messages](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

- ← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)
  - ← [GROUP 18: Electrical Distribution](#)
- 

## SECTION 418-01: Module Configuration

---

### DIAGNOSIS AND TESTING

[Module Configuration](#)

[Principles of Operation](#)

[Inspection and Verification](#)

### GENERAL PROCEDURES

[Programmable Module Installation \(PMI\)](#)

[Programmable Module Installation \(PMI\) Using the Integrated Diagnostic System \(IDS\) When the Original Module is Available](#)

[Programmable Module Installation \(PMI\) Using the Integrated Diagnostic System \(IDS\) When the Original Module is NOT Available](#)

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 19: Electronic Feature Group](#)

---

**SECTION 419-01:**  
**Anti-Theft - Passive Anti-Theft System (PATS)**

---

DESCRIPTION AND OPERATION

[Anti-Theft](#)

DIAGNOSIS AND TESTING

[Anti-Theft](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

GENERAL PROCEDURES

[Key Programming Using Diagnostic Equipment](#)

[Key Programming Using Two Programmed Keys](#)

[Anti-Theft Security Access](#)

[Key Programming Switch State Control](#)

[Spare Key Programming - Using Diagnostic Equipment](#)

[Spare Key Programming - Unlimited Key Mode](#)

REMOVAL AND INSTALLATION

[Passive Anti-Theft System \(PATS\) Transceiver](#)

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 19: Electronic Feature Group](#)

---

## **SECTION 419-03: Cruise Control**

---

### SPECIFICATIONS

#### DESCRIPTION AND OPERATION

##### Cruise Control

#### DIAGNOSIS AND TESTING

##### Cruise Control

##### Principles of Operation

##### Inspection and Verification

##### DTC Charts

##### Symptom Chart

##### Pinpoint Tests

#### REMOVAL AND INSTALLATION

##### Cruise Control Switch

##### Cruise Control Deactivator Switch

← [2010 Crown Victoria, Grand Marquis  
Contents/Index](#)

← [GROUP 19: Electronic Feature Group](#)

---

## SECTION 419-10: Multifunction Electronic Modules

---

### DESCRIPTION AND OPERATION

[Module Controlled Functions](#)

### DIAGNOSIS AND TESTING

[Diagnostic Trouble Code \(DTC\) Chart](#)

[Driver Door Module \(DDM\)](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

[Lighting Control Module \(LCM\)](#)

[Principles of Operation](#)

[Inspection and Verification](#)

[DTC Charts](#)

[Symptom Chart](#)

[Pinpoint Tests](#)

### REMOVAL AND INSTALLATION

[Driver Door Module \(DDM\)](#)

[Lighting Control Module \(LCM\)](#)



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-- SPECIFICATIONS --

---

[Acceleration Control](#)

[Accessory Drive](#)

[Automatic Transaxle/Transmission External Controls](#)

[Automatic Transaxle/Transmission - 4R70E/4R75E](#)

[Battery, Mounting and Cables](#)

[Body Closures](#)

[Body Repairs](#)

[Body System - General Information](#)

[Brake System - General Information](#)

[Bumpers](#)

[Charging System](#)

[Climate Control](#)

[Climate Control System - General Information and Diagnostics](#)

[Cruise Control](#)

[Driveline System - General Information](#)

[Driveshaft](#)

[Electronic Engine Controls](#)

[Engine Cooling](#)

[Engine Emission Control](#)

[Engine Ignition - 4.6L \(2V\)](#)

[Engine System - General Information](#)

[Engine - 4.6L \(2V\)](#)

[Evaporative Emissions](#)

[Exhaust System](#)

Lighting Control Module (LCM)

Exterior Lighting

Exterior Trim and Ornamentation

Fire Suppression System

Front Disc Brake

Front End Body Panels

Front Suspension

Fuel Charging and Controls - 4.6L (2V)

Fuel System - General Information

Fuel Tank and Lines

Full Frame and Body Mounting

Glass, Frames and Mechanisms

Handles, Locks, Latches and Entry Systems

Horn

Hydraulic Brake Actuation

Instrument Panel and Console

Intake Air Distribution and Filtering

Interior Trim and Ornamentation

Parking Brake and Actuation

Power Brake Actuation

Power Steering

Rear Disc Brake

Rear Drive Axle/Differential - Ford 8.8-Inch Ring Gear

Rear Suspension

Rear View Mirrors

Safety Belt System

Seating

Starting System

Steering Column

Steering Column Switches

Steering System

Supplemental Restraint System

Suspension System - General Information

Transaxle/Transmission Cooling

Vehicle Dynamic Suspension

Vehicle Dynamic Systems

Wheels and Tires

Wipers and Washers

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